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ABSTRACT

In the past 30 or 40 years there has been much discussion about what factors contribute to readability in texts. In an attempt to characterize factors not measurable by current objective readability formulas, four texts that were adapted for younger readers were compared with their originals to see what kinds of changes adaptors had made and to assess the effectiveness of the changes. A taxonomy of the adaptive changes was developed and possible motivations behind the changes were suggested. Changes were found to be interdependent and influenced by factors such as assumed knowledge of the background, definition of the discourse topic, logical ordering of ideas, and syntactic structure, as well as limitations imposed on passage length, sentence length, and vocabulary choice. Adaptation was found to be most successful when the adaptor functioned as a conscientious writer rather than as someone trying to make a text fit a readability formula. Based on these analyses, the use of readability formulas as guides to writing is not suggested. (Author/MKM)

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Technical Report No. 162

LIMITATIONS OF READABILITY FORMULAS IN GUIDING ADAPTATIONS OF TEXTS

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Table of Contents

Introduction 2

- General Remarks 2
- Choice of Texts 7
  - General features of the texts 8
- Method 9
- Adaptor's Methods 10

Sentence Restructuring 13

- Sentence Splitting 16
- Clause Merger 20
- Clause Restructuring for Effect in Discourse 32
  - Adverb preposing 33
  - Active and passive sentences 39
  - There in subject position; there-insertion 42
  - Reordering of clauses and "natural" order 45
  - Paraphrase and condensation 47
  - Expansions 49

Content 51

- Modality 52
- Basis Information 56
- Organizational Information 60
- Elaboration 67

- Exemplar information 67
- Elaboration chuncks 69
- Qualification information 77
- Connectives 82
- Referential Connection 86
- Thematic Information Deletion 89
- Definitional Information 92
- Lexical Change 95
- Word Lists and Readability Formulas 96
- Lexical Exchange 99
- Specialized and technical vocabulary 101
- Idioms 103
- Vague and ambiguous vocabulary 105
- Obsolete vocabulary 107
- "Thematic" Change 108
- Complex Changes 110
- Changes in syntactic category 110
- Restructuring caused by change in lexical items 111
- Changes in Rhetorical Devices 112
- Direct Reference to Reader 113
- Use of imperatives 113
- Use of "you" 114
- Use of rhetorical questions and direct quotes 115

Devices Expressing Point of View 117
  - Higher predicates expressing source of information 118
  - Hedged expressions 121
  - Emotionally loaded words 121

Additional Stylistic Changes: Shift from Colloquial to Formal Language 123

Concluding Remarks 124

Reference Notes 136

References 137

Footnotes 141

Abstract

In the past 30 or 40 years there has been much discussion about what factors contribute to readability in texts. In an attempt to characterize factors not measurable by current objective readability formulas, we compared four texts that were adapted for younger readers, with their originals, in order to see what kinds of changes adaptors had made, and to assess the effectiveness of the changes. We present in this paper a taxonomy of the adaptive changes and a discussion of the possible motivations behind the changes with our evaluations of the changes in particular cases.

Changes were found to be interdependent and influenced by factors such as assumed background knowledge, definition of the discourse topic, logical ordering of ideas, and syntactic structure, as well as limitations imposed on passage length, sentence length, and vocabulary choice. Adaptation was found to be most successful when the adaptor functioned as a conscientious writer rather than as someone trying to make a text fit a readability formula. We argue against the use of readability formulas as guides to writing, and urge further experimental research to define the real factors constituting readability.

Limitations of Readability Formulas in Guiding Adaptations of Texts

Introduction

General Remarks

For the last 30 or 40 years much attention has been paid to formulas that claim to measure readability. Their widespread use is bound to have an effect on the texts that are produced for children learning to read. In this paper we would like to consider the implications of using these formulas not just for measuring readability, but also as a guide to producing texts. The creators of the formulas and others have always warned against using the formulas as guides to production, because the correlation of infrequent vocabulary and long sentences to difficulty in reading is not the same as a causal relationship. Furthermore, it is in fact impossible to use these formulas literally as guides to writing because, provided that one wants to preserve content, the injunction to simplify vocabulary, perhaps by paraphrase, conflicts with the injunction to shorten sentences.

But there is an inescapable temptation to use these formulas as a guide to writing, especially if the writer is under an obligation to produce materials at a specific readability level. Publishers of textbooks, for children as well as college students, have recently been eager to guarantee the reading levels of their product, and the issue of guaranteeing readability levels is coming to have wider application with the institution of the "Plain English" requirement for many legal and other documents and with new interest in accurate captioning for hearing impaired people.

At the outset of this study, we were originally interested in "features" and properties of texts designed to be read by children, and we decided to investigate this by comparing versions of the same text. It was in categorizing the kinds of changes that were made in adapting an adult text for children that we became aware of what we believe to be the pervasive effects of readability formulas.

Readability formulas can actually be looked at from two very different points of view. On the one hand, from the standpoint of those interested in objective measurement, statistical correlations, and readability levels calculated from the average of small samples of a text, formulas have some obvious attractions. They can be applied to different text types (such as narratives, expository prose, technical prose), they require little specialized training in the person who uses them, and their results have very high statistical correlations (.8 or .9) to other measurements of readability. These include publishers' assigned grade level (which might have been influenced by readability formulas in the first place), success of students on comprehension questions based on standard passages, and successs of students at a certain grade level in cloze texts, where every nth (usually 5th) word is deleted and the students must correctly guess the missing words in at least 50% of the cases. Of course, one may question the validity of these measurements, as they may be arbitrary or circular. And one might object to applying the same measurement which gives accurate averages over large populations and many samples of text to other cases such as measuring the performance of individuals in the comprehension of specific texts.

From another standpoint, readability formulas can be criticized because they do not define readability. They measure factors which may reflect readability, but they do not point to all the features of a text which actually contribute to comprehension. The use of an objective measurement like a readability formula presupposes that the text already exists; it assumes that a writer chose a topic, made decisions about how to order the ideas within the topic, and then decided how to express the ideas in words. Mistakes and faults in the writing of the text might affect comprehension in ways which would not influence the score given by the readability formula, as writers such as Freeman (Note 1) and Charrow (Note 2) have pointed out. Many such critics of readability formulas take a more subjective, relativistic view of readability. That is, they view factors such as sentence length, syntactic structure, vocabulary, etc., as contributing to complexity relative to other factors, such as the purpose of the author, the structure of the text, the definition of discourse topic, and so on. This kind of view might appear to be the antithesis of the position which values the objectivity of readability formulas. Yet readability formulas are dependent on a number of subjective factors, namely those which constitute the skill or common sense of the writer who is presumed to have created a coherent, well-formed text to which objective measurement may be applied. In effect, "readability" is a combination of whatever is measured by formulas plus a combination of unexplored and undefined factors, sometimes called a "Black Box."

The contrast of these two views becomes crucial in the production of texts for use at a specific grade level. Objective measurements do not tell a writer how to produce a text, as numerous writers on formulas have pointed out. Yet writers may try to tailor their sentences and use of words so that the formulas will yield the reading-level figure that is being aimed at. Of course adaptors do not follow readability formulas slavishly. In this study, we noted a good deal of conscientious and careful rewriting, but as the examples we will discuss presently show, it seems that vocabulary lists and restrictions on sentence length and passage length are often given primary importance at the expense of other factors which no one would deny are related to readability. These include the syntactic structure of sentences, the logical or discourse connections between sentences or clauses, coherence of topics, and similar categories. We will argue that more attention needs to be given to these factors for which there is to date no objective measurement.

We looked at four texts from SRA Reading Laboratory 3b, designed for students in 8th, 9th, or 10th grade who are reading at levels 5 to 6. We secured the original sources and did a sentence by sentence comparison of the corresponding portions in the originals and their adaptations.

The figures given in Tables 1, 2, and 3 summarize some of the overall changes which were made in adapting the texts. All the texts were shortened, as Table 1 shows. Overall average sentence length in words was lowered, and the average number of clauses per sentence was reduced for the two texts which we analyzed in this way. The readability level was lowered for each text, as measured by the Fry and Dale-Chall formulas applied to the original texts and corresponding adaptations. We prepared an exhaustive listing of all the changes made in the adaptations, from which we derived a taxonomy of change types in adaptation. This taxonomy, with examples and commentary, is discussed in the body of the paper. The commentary will be directed towards the considerations beyond the scope of readability formulas, to which writers have to give attention.

Insert Table 1 about here.

For example, the writer should worry first of all about the overall presentation of ideas, i.e., the order in which ideas are to be presented and their logical interrelationships. Also the writer must be concerned with more local organization; i.e., what the topic of discourse is at various points in the text, how it is marked, and transitions between ideas. Here also the writer has to take into account the abilities of the intended readers to process information. Writers and editors are only able to make educated guesses about what these abilities might be.

Since the intended reader may not possess requisite background knowledge to understand a fact or concept, the writer must sometimes fill this information in for the reader. Finally the writer must worry about matters which influence/shape the reader's interpretation of information, e.g., whose attitude is being expressed or whether a statement asserts a fact or is just a supposition. In the process of creating a text, the writer must decide how to relate these global considerations to the words and sentences of the text. Readability formulas measure only these words and sentences, and simply cannot measure the more global relationships required for what most would consider a readable, comprehensible text.

Choice of Texts

What we thought would be most suitable as material for the study was an original adult-level text and an adaptation that had been made from it by substantially altering the text without substantially rewriting it. We were therefore confined to adapted texts written for middle reading levels. For very young readers, adaptations of suitable material involve both extensive condensation and rewriting, so that corresponding sentences in the original and adapted version are hard to match. The rewriting could be expected to narrow greatly the range of vocabulary items and sentence constructions. For the higher levels, adaptation usually involves some condensation but usually not the kind of specific changes in vocabulary and structure that we were interested in examining. We therefore decided that the 5th to 8th grade reading levels offered the type of adaptation most likely to contain the kind of specific, local changes we could look at in detail. A preliminary study was based on two texts ("Skillbuilders") from the Reading Laboratory IIIb, published by Science Research Associates in the 1960s (Parker, 1963). After looking at other texts in the same Reading Laboratory, we chose two others, and the current study is based on these four.

General features of the texts. For this study, we wanted examples of different types of texts--narrative, historical exposition, scientific exposition, etc.--as well as examples of texts in which a broad variety of changes had been made. We wanted to generalize about adaptations, independently of text type. The four texts we chose represent a cross-section of text types, though certainly not all the types that one could imagine:

> "Sequoia National Park" from Our Country's National Parks by Irving Robert Melbo (1960) Bobbs-Merrill. Adapted as "California's Giants." (Scientific exposition and historical narrative) [TREES]
>
> "Milk," by Grace H. Glueck. New York Times Magazine, February 18, 1962. (Exposition of facts) [MILK]
>
> "Prisoners of the Flood," by Jennie Parsons. McClure's Magazine Vol. XLI, no. 3 (July 1913). Adapted as "Disaster in Dayton." (First-person narrative) [DAYTON]
>
> "Living Light on Land and Sea," by Dr. Norman T. Mattox. Science Digest, April 1961. Adapted as "Living Light." (Scientific exposition) [LIGHT]

Table 1 gives comparative figures on the number of words, number of sentences, and reading level of the texts. Additional information about sentence length can be found in Table 2, in the section on restructuring below.

Insert Table 2 about here.

Method

We made detailed comparisons of the original and adapted versions of the texts. Each sentence of the adapted version was typed on a separate page and matched with the corresponding sentence(s) of the original, if there were recognizable correspondences. The pages were kept in the sequence of the sentences of the adapted version, so that it was possible to make reference to preceding and following sentences in the exposition. As the sentences of the original were also numbered in sequence, it was possible to keep track of the relative order of the original sentences as well, though it was not as easy to keep in mind the text structure of the original because of condensation and reordering of some passages in the adaptation.

We wrote detailed comments describing: (a) what precisely was changed and what (different) properties the new version had; (b) the apparent motivation for the change; what increase in readability we thought the adaptor was trying to achieve; whether the text structure itself was meant to be improved by the change; and (c) how successful we felt the change was, generally, this last part of the discussion took the form of speculation about what information was made more clear, or less clear; whether unforeseen or unwanted difficulties might arise from the change; whether the new version required inferences to be made by the reader in order to understand the text correctly; and whether it was clear which of several possible inferences was the right one.

The comments on each sentence and sentence group were collated, and then the changes were broadly categorized according to type. The taxonomy which is presented in the following sections is a refinement of the original, more or less intuitively based categorization. As patterns began to emerge, and as we tried to formulate general characterizations, we were able to reduce and clarify the categories.

Adaptors' Methods

In the sections which follow, many of our remarks are concerned with the motives that an adaptor might have in making a certain change, and with the problems that an adaptor might be trying to avoid. In the course of doing this study, we felt that it would be helpful for confirming or correcting our conclusions to talk with at least one person who had had experience in doing adaptations at all stages, from the choice of text to the editing of the final version. We were able to talk with Mr. Glenn Phillips, Editorial Manager at Science Research Associates, who gave us some very useful information about how the SRA materials are produced, and some perspective we wanted on how an adaptor perceives the problems of adapatation. According to Mr. Phillips, the professional background of adaptors tends to be in writing and editing, rather than in education or developmental psychology. They are, however, aware of what work is available in these fields, particularly studies of what constitutes "difficult" linguistic constructions for different age groups.

We were very much interested in how great a role was played by readability formulas and by the overall length of the adapted text. The nature of the SRA materials gives these factors considerable importance, since there are a fixed number (15) of texts ("Power Builders"), of different genres at each of 10 levels, which differ from the next higher one by the equivalent of one or one-half grade reading level. Each level also has fixed length in number of words, which is constant for the texts in each level and greater than the limit for the texts of the previous level. The overall design of the SRA materials therefore assigns a crucial role to overall length of the adapted version of the text, and to its difficulty, of which the most "reliable" measurement in statistical terms is still the average score produced by readability formulas. A modification of the Fry readability formula is used for checking the successive versions of an adaptation, with another formula (Dale-Chall) applied as a cross-check towards the end of the process.

In the SRA series, any text which is made into an adaptation must be able to be condensed to the overall length in number of words for the reading level for which it is to be used. A text may be discarded if it cannot be condensed enough and still remain a coherent text. Thus, text length may somewhat determine what is cut out of the original of a text which is not discarded; the length and organization of the original are intrinsic properties which can be varied only up to a point.

Texts must, in addition, be chosen to represent different genres (scientific expositions, narratives, mysteries, etc.), and to reflect an equal balance of male and female protagonists, as well as adequate representation of minority groups. The subject-matter of the texts must be of interest to readers of the age group it is intended for, and the vocabulary which is required to communicate its contents adequately must have already been introduced by basal readers appropriate for the reading level the students had attained.

Potential texts for adaptation are therefore searched out, tried out, tentatively adapted, and winnowed down into the much smaller number which is finally included in a series. To some small degree, chance enters into the specific properties of the adapted texts, and, in some cases, a choice represents a compromise between a number of conflicting constraints, as our discussion will show in the following sections.

As there are many kinds of adaptation with different purposes involved, the discussion which follows in this paper is intended as a representative description of how adaptations are done, not necessarily typical of every case of adaptation. Since there are so many factors to reconcile, preservation of exact relationships in the text may not be of primary importance in the kind of adaptation in the SRA Series, which is intended mainly for reading practice. It would be quite another matter where the contents of a text are to be reproduced accurately and completely at a lower level of difficulty, probably entailing an increase in the overall length of the text. In addition, readability formulas seem to us to have a pervasive and determining effect on vocabulary and sentence length in the adapted version, as these are more easily varied than overall length. In any case, the SRA adaptations are written "to" specific overall length and reading levels determined by formulas, and these factors must clearly play a large role in the choices the adaptor has in changing the text. As our subsequent discussion will show, however, these formulas are not blindly or mechanically followed as guides. Finally, well documented empirical studies showing what is complex for what level of development, and what contextual factors may affect complexity, would in our view be of great value in improving adaptations and increasing their effectiveness. We hope that such studies will be the ultimate outgrowth of the results we present here.

Sentence Restructuring

In this section, we will be discussing changes in sentence structure in adaptation. These changes include splitting one sentence into two or more separate sentences, merging sentences or parts of larger sentences into one self-contained sentence, and changing word order and syntactic properties of a sentence. The changes we have observed are assumed to be motivated by the goal of increasing readability. Sentence length is clearly a property of sentences which is related to readability. One of the primary linguistic features which is measured by readability formulas is the length of sentences and sentence complexity, particularly where complexity involves not just numbers of sub-constituents of the sentence, but also the number of coordinate or subordinate clauses. Certainly a sentence containing a large number of unreduced clauses would tend to be longer than a sentence with fewer clause constituents. But shorter sentences are not necessarily simpler, because certain syntactic processes which condense sentences may also make them more complex and thus more difficult to process.

For example, ordinary measures of complexity might not adequately capture the complexity of the logical relations in (1)O (Original) which has a fairly simple syntactic structure and is not very long. Yet the semantic contents are not so simple, as the paraphrase from the adapted version (1) A (Adaptation) shows:

(1) MILK

O. Hippocrates recommended milk to his patients as a curative beverage. (1 clause; 10 words; 21 syllables)

A. One of the most famous Greek doctors told his patients [to drink milk [to cure illness]]. (3 clauses; 16 words; 20 syllables)

Though (1)A seems clearer and more easily understood than (1)O, the crude measurement of its length and syntactic structure cannot indicate this. Of course, the length and number of less familiar words in (1)O would predict that it would be harder to comprehend than (1)A.

Nevertheless, it is plausible that on the average, sentence length and constituent complexity are related. Bormuth (1966) notes a direct correlation between sentence length (measured in number of syllables), and depth of embedding, which in turn is an indirect measure of clause complexity. The correlation between sentence length and reading level is confirmed by results of cloze tests.

If shorter sentences are supposed to be more readable, it is easy to predict that one general trend in adaptation of texts will be reduction in overall average sentence length (assuming that the originals were not written specifically for children). This is in fact a feature of all the texts analyzed in this study. The reduction is least in the case of TREES, which was written originally as a children's text (see Table 2).

Sentence length and clause complexity show a general reduction in all the texts. The sentences in the adapted version of MILK are half the length of those in the original, on the average. The number of sentences having three or more clauses is sharply reduced in the two texts having the longest sentences in their original versions. A sentence-by-sentence examination of the corresponding original and adapted texts shows a general decrease in sentence length and number of clauses per sentence. The average figures in Tables 2 and 3 show this also, in combination with the fact that the overall number of words in the text decreases as well. Thus, many of the sentences, and not just the most difficult or longest, are reduced in some way. Shortening the overall average length of sentences is apparently a general procedure in adapting texts as reading materials.

Insert Table 3 about here.

We performed an informal experiment, using amateur adaptors, who were asked to lower the level of reading difficulty of LIGHT in its original form in order to see if the results would differ widely from the professional adaptation. They were allowed to use whatever means they wished. Most sentences that were not deleted were left in their original form. Only sentences which were strikingly long or complicated were split up or paraphrased, not always in the same ways. In the professional adaptations, on the other hand, any sentence above a certain length is likely to have undergone some change which has the effect of shortening it. From this we feel it legitimate to conclude that readability formulas closely influence decisions about how to change sentences throughout a text; that adaptations are "written to" readability formulas. A general policy of shortening sentences has the effect of maintaining uniformity throughout the text. It seems not to be desirable from the adaptor's viewpoint to have one section of very short sentences and one of very long sentences, even if that would give the appropriate average.

Though the effects of reducing sentence length are often quite subtle, they do involve some loss of information about the connections between clauses or shifts in focus or emphasis. In the sections which follow, we give examples of how clauses are separated, rearranged into larger sentences, or even selected out of a longer sequence of sentences and combined into one larger sentence.

Sentence Splitting

One of the frequently used ways in which sentences are reduced in length, so that the average sentence length for an adapted text does not surpass some maximum chosen by the adaptor, is to split the sentence into its component clauses. For example:

(2) LIGHT

O Their dried bodies can be ground into a powder which will produce light when mixed with water.

A Their dried bodies can be ground into a powder. When the powder is mixed with water, it will produce light.

(3) TREES

O If given a chance before another fire comes, the tree will heal its own wounds by growing new bark over the burned part.

A If given a chance before another fire comes, the tree will heal its own wounds. It will grow new bark over the burned part.

(4) MILK

O Casein was one of the first materials used to make plastics, and today buttons, belt buckles and some costume jewelry are still made from it.

A Casein was one of the first materials used to make plastics. Buttons, buckles, and some costume jewelry are still made from it.

(5) DAYTON

O I had kept my nerve pretty well till dawn, just as the faint light was coming, when we looked out and saw the water whirling by against the bay window.

A But we all kept our courage up. As the faint light of dawn was coming, we looked out. The water was whirling by.

Subordinate clauses become independent clauses, as in (2), where a relative clause becomes separated, and as in (3), where an adverbial clause of means becomes a simple independent clause. Coordinate structures may be split up into independent clauses, as in (4) and (5).

Sequences of long and short sentences may be rewritten so that there are two clausally complex sentences, neither of which is extremely long:

(6) DAYTON

O (a) He was shivering all over. (b) So we wrapped him up in all the blankets we had and (c) he lay down on the floor in the front room, (d) and went right to sleep.

A (a) He was shivering all over, (b) and we wrapped him in all the blankets we had. (c) He lay down on the floor and (d) went right to sleep.

In (6) a sequence of one clause followed by a long coordinate sentence with three clauses in the original is reshuffled into two two-clause sentences. While the original should pose no particular difficulty of comprehension to a reader, the change in the adapted version has the net result of reducing both the length and clause complexity of the original. While one- and two-clause sentences seem to be usual, three- and especially four-clause sentences nearly always seem to be candidates for splitting or other kinds of reduction, such as outright deletion of a clause.

Sometimes, reduction in original sentence length involves deletion of some of the contents; in these cases, the remaining pieces may be recombined into larger units which follow the limits on average sentence length. If material is not simply deleted, then reducing sentence length by splitting up clauses into separate sentences has some very important consequences. In general, when splitting into independent sentences takes place, a subordinate clause no longer has an expressed grammatical relationship to the main clause. A relative clause no longer functions as a modifier of a noun phrase (NP), an adverbial no longer modifies a verb or whole proposition. The adaptor then has to repeat the item which forms the link, either the head NP, (the powder in (2)), or the unexpressed subject (the tree, it in (3)), etc. The use of anaphoric devices such as pronouns, and definite and demonstrative NPs allows the reader to infer that there is some semantic or discourse relation between separate sentences. (Examples of numerous such devices are discussed in Halliday and Hasan, 1977, but note criticisms of their claims in Morgan and Sellner, in press.)

For example, the inclusion of the by adverbial clause in example (3)0 conveys that the healing process in a tree involves the growth of new bark. In the adapted version, the reader must figure out this connection from the adjacency of the separate sentences, and with the help of real-world knowledge about trees. A younger reader may not have such knowledge, or not have it in very accessible form. In example (6), the four clauses are redistributed over the two sentences. In the original, the first sentence describes what appears to be a single salient state. The second sentence describes three subsequent closely related actions. In the adaptation, clause (b) is conjoined with the first, giving the effect of its being the sole result of (a), and of its not being so closely related to (c) and (d).

The restructuring of the clauses in conjoined structures does not necessarily affect meaning, but, as in this case, the reader may perceive the relations between the events differently depending on which version is read.

Clause Merger

In a number of cases, clauses or fragments of clauses from separate sentences may be combined into a single sentence in the adapted text. We are using the word sentence in its broadest, typographical sense. Thus, the following case constitutes merger even though it is brought about by a change in orthography alone. The O version contains a direct quote of two separate sentences:

(7) DAYTON

O "No," she said. "But if I were you, I'd send up and get some bread, anyway."

A "No," she said, "but if I were you, I'd send up for some bread."

The A version retains the direct quote (with a few variations), but changes the full stop to a comma, thereby creating one single sentence. Admittedly, this is hardly a significant case in itself, but this type of change is common. Note that such a change creates a sentence which is orthographically longer and, as such, may (adversely) affect readability scores. One obvious motivation the adaptor could have for risking this consequence is to increase the effect of text cohesiveness by connecting clauses or phrases orthographically or syntactically when they seem to belong together semantically. As such, clause merger may be viewed as a complementary process to clause splitting, which tends to shorten sentence length and lower the number of clauses per sentences (see Clause Splitting above).

Pushed as far as possible in the direction of "simplicity" (i.e., short, single-clause sentences), such processes as clause-splitting (and possibly content deletion as well) would produce a text consisting of a series of unconnected clauses, thereby adding to the task of the reader. Merger can counteract this weakening in text cohesiveness by recombining elements that go together.

Merger may also be necessary in those cases where splits and deletions leave behind residual phrases which contain important content but which cannot stand as independent sentences. After deletion of a particular theme (for example, references to sex) such clauses or phrases may remain. Consider the following excerpt from LIGHT, which contains references to reproduction which the adaptor chooses to delete:

(8) LIGHT

O The famous Palolo worms are good examples. They leave their burrows in coral masses and only at regular periods of the year take part in reproductive swarming activities. The Pacific Palolo worms emerge only at dawn on the day of the last quarter of the moon during the months of October and November.

A The Pacific Palolo worms come out of their burrows in coral masses only at dawn on the last day of the last quarter of the moon in the months of October and November.

Elimination of the reference to sex, besides removing the explicit explanation for the phenomenon being described, would leave behind a short and rather purposeless clause, followed in turn by redundant material. (9) is the hypothetical result of this kind of content deletion which will then undergo restructuring and merger:

(9)

> The famous Palolo worms are good examples. They leave their burrows in coral masses. The Pacific Palolo worms emerge only at dawn on the day of the last quarter of the moon during the months of October and November.

In the original the first sentence serves as a topic sentence, which no longer has a place in the adaptation, since the organization has been somewhat changed. In order to minimize the redundancy, but also solve the problem of the clause left dangling as a result of deletion, the adaptor could collapse the information into a single sentence. This, in fact, is the case in (8)A.

Examination of the original texts and their adaptations reveals a number of other strategies which can best be grouped under the general heading of clause merger. Merger via a change in punctuation as in example (7) above, is not very revealing, and probably reflects some convention of prescriptive grammar, much like the frequent deletion of sentence-initial conjunctions in adaptation.

Of greater syntactic consequence are such devices as merger via coordination, merger via some kind of subordination, relativization, nominalization, and other processes which involve reshuffling elements from one sentence into another. (See also the discussion of connectives in Content.)

Two separate sentences in O may be merged into one sentence in A by using a connective, such as the coordinating conjunction and. In example (10), the O version contains two independent sentences (although each begins with the word but, these are not really functioning as conjunctions linking clauses in this case; see below), while the A version joins the two with and:

(10) DAYTON

O But then suddenly it began to get dark . . . But now we all began to feel kind of creepy.

A Soon it began to get dark, and we all began to feel creepy.

Ignoring the other changes, we can see that coordination is an easy means of connecting sequential events.

Coordinate conjunctions, particularly and and but, do not supply much semantic content in and of themselves. They do however indicate that there is a link between two or more clauses, in distinction to other, independent sentences which may precede or follow in the discourse. Their use normally is an occasion on which the reader is expected to fill in a stronger relation, such as "same topic/event," "When S, then S" or "Cause-effect" (cf. Schmerling, 1975). Even initial And and But may serve this purpose, although the preceding sentence is (graphically and intonationally) separated from the clause it introduces. The narrator uses initial And and But and So quite frequently in Dayton in the original version; these are uniformly deleted in the adaption, as are all conjunctions when two separate sentences are formed by splitting conjoined clauses. All that remains is the weaker degree of information that one sentence precedes or follows another, from which some information can be filled in by inference, but with less certainty.

In example (10) above, the second conjunct is obviously meant to be resultative in meaning; i.e., it was the darkness that made them all begin to feel creepy. But this meaning is not explicitly present in either the O or the A version. The connection must be inferred. The presence of and provides the reader with a clue to the relationship, but and can signify a number of other types of connections, such as natural order; i.e., sequence in time:

(11)

I toasted the muffin and (then) poured the Hollandaise over it.

consequence:

(12)

I heard a scream and (therefore) turned around.

contrast:

(13)

He's tall and she's short.

and at least several other kinds of relations between the clauses (cf. Schmerling, 1975). Coordination, like the punctuation changes described above, adds to the continuity of the text, but really only minimally aids the reader in determining the relationship between the contents of the clauses.

The relationship between contents of different clauses can be disambiguated by adverbials or other lexical means as well. Example (14) uses the adverb then in the O version to establish the time sequence, while the same sequence is expressed by means of an adverbial clause introduced by after in the A version:

(14) DAYTON

O So finally he reached us, though I thought he never would. And then we carried some more stuff upstairs.

A After he reached us, everybody in the house went up to the top floor.

The use of such devices as adverbial clauses can help the reader connect the actions or ideas by providing fairly explicit clues to the kind of relationship which is relevant.

Occasionally, merger will be used by the adaptor when the original text describes events in an order which is unusual or even misleading. The following example from DAYTON places the resultative clause first, contrary to the more usual order:

(15) DAYTON

O We had water to drink after that. We set out basins and caught the raindrops.

A We set out basins to catch the raindrops so that we would have water to drink.

Note also that the relationship between the conjoined clauses of the second sentence of O must be inferred, since and has a number of possible purpose clauses. In this way, clause merger can explicitly state relationships which are only implicit in the original text.

Inferences about time sequence and cause-effect relations are particularly vulnerable to distortion when there are gaps in information resulting from clause splitting. The deletion of a conjunction or the use of a vague one may obscure and make it harder to comprehend causal relations (cf. Pearson, 1974-75). In the texts examined in this study, few serious gaps occur, but there are cases where we feel that some important information is lost which was expressed either by the grammatical relation between the clauses or by the presence of the conjunction. For example:

(16) DAYTON

O "I'm going down to the contract," said Jack, "to see that everything is all right."

A "I'm going down to the building project," Jack said. "I have to see if everything is all right."

In example (16), the meaning of purpose is not really expressed by the assertion of obligation in the adapted version, where the counterpart of the to purpose clause is a separate sentence without an overt conjunction. Its connection to the previous sentence is inferable but not directly stated. In (17), the original has an assertion followed by a justification for the assertion, introduced by for (a conjunction seldom used in spoken American English):

(17) LIGHT

O Columbus undoubtedly observed the "fire worms" of the West Indies, for he referred in his log to "moving torches of light" near the coral reefs of the islands.

A In his log, Columbus referred to "moving torches of light" near the coral reefs of the West Indies. Undoubtedly he had observed the "fire worms" of that area.

The adapted version changes the original order, which follows temporal order, to one which obscures the temporal order and places the sentence expressing the main conclusion second, where it could be taken as a sort of explanation for the previous sentence. While such changes do not make the text uninterpretable or destroy comprehension, we would guess that they do not facilitate comprehension, and may on occasion hinder it. Research is needed to investigate our conjecture.

Clause merger may be brought about by a number of other syntactic processes. One of the most frequent is that of reduction of a full clause in O to a relative clause in A. A description of the flowers of Sequoias in TREES reads as follows:

(18) TREES

O They produce bright green cones about two and a half inches long. The cones contain tiny seeds, usually no more than a fourth of an inch long.

A The flowers give way to bright green cones containing tiny seeds.

The adapted text merges these two sentences into one by means of a reduced relative clause.

In a number of cases, the merger is brought about by the creation of an appositive phrase. In example (19) the O text of TREES contains an existential there construction, followed by a descriptive sentence in the passive. The A version eliminates the need for a separate existential statement by naming the tree in apposition to the main clause:

(19) TREES

O There is one tree in the Giant Forest called the Black Chamber. The whole inside has been eaten by fire.

A One tree in the Giant Forest, the Black Chamber, has had its whole inside eaten out by fire.

A similar example occurs in TREES when the text introduces the name of someone associated with the idea of the Sequoia National Park:

(20) TREES

O The best work was done by Colonel George W. Stewart and a number of his close friends. Colonel Stewart was the editor of a weekly newspaper printed in the country seat town of Visalia, California, not far from the Giant Forest.

A The best work was done by Colonel George W. Steward (sic), the editor of a weekly newspaper printed not far from the forests.

The adapted version contains an appositive relative clause expressing the content of the original second sentence (with a few changes). The result of relativization seems to be a reduction in the number of words needed to cover the same material. In fact, because text shortening is a major consideration in adaptation, relativization proves to be effective for this purpose. While economy of words is clearly one major factor in motivating changes in structure, we would suggest researching what effects these changes have on comprehension.

There seem, then, to be two principal motivations for clause merger: specification of the semantic relationship between the separate clauses (e.g., time sequence, result, cause), and brevity. Both add to text cohesiveness by establishing more clearly how different items relate to each other semantically. There may be another factor as well. Well-known readability formulas rely on sentence length, and while none of the adaptors rigidly follows formulas, there is clearly a range of sentence lengths established for each text, which we suppose represents a kind of standard which an adaptor adheres to. This standard length represents a kind of ideal sentence length for that particular adaptation, from which any given sentence must not vary by too large a margin.

In DAYTON, for instance, sentences average nine words each (cf. Table 1 above). Merger, along with sentence-splitting, is a way in which this average length can be maintained. For example, a passage from the O version contains two sentences of above-average length. Via deletion, the adaptor is left with fragments of both sentences, which can then be merged into one sentence of average length:

(21) DAYTON

O But then, when we thought the worst was over, the fire came. (12 words) About four o'clock, I looked out of the front window and saw a lot of smoke about a block up the street. (21 words)

A But then, about four o'clock, the fire came. (8 words)

Instead of two sentences of 12 and 21 words respectively, the A version has reduced the passage to one sentence of a near-average eight words. While not all cases of merger shorten sentences, this is clearly one possible motivation. Clause merger may simply be a consequence of such massive deletion of material. In an attempt to drastically shorten a text, the adaptor may have little choice but to reshuffle the remaining content in such a way that parts of one sentence end up in a different sentence in A. It is not unusual for clause merger to go hand-in-hand with clause splitting (as in (6) above), picking up leftover material from one and incorporating it into another sentence.

In order to reduce the lengthy sentences reproduced below, a number of changes are required. The original three sentences are broken up into five shorter ones in the A version:

(22) LIGHT

O Motor launches take visitors into such a lagoon (a) on the southern coast of Puerto Rico where (b) on dark nights there is a dramatic display of luminescence. (c) Curving lines of light fall from the bow (d) as the launch enters the lagoon, and (e) a trail of light is left in the boat's wake.
In the lagoon, (f) which has one of the greatest concentrations of bioluminescence in the world, (g) it appears as though a huge floodlight were burning under the launch, and the bow seems to be plowing into a wall of fire.

A (a) On the southern coast of Puerto Rico is a lagoon (f) that has one of the greatest amounts of bioluminescence in the world. (b) On dark nights, it creates a very dramatic display.

> (d) As the motor launch takes visitors into the lagoon, (c) curving lines of light fall from the bow. (e) A trail of light is left in the boat's wake. (g) It appears as though a huge flood light were burning under the launch, and the bow seems to be plowing into a wall of fire.

In addition to the clause-splitting, segments of one sentence end up in another sentence. For instance, the main clause of the first sentence in O, Motor launches take visitors into such a lagoon, becomes a subordinate clause in the third sentence in A:

(22')LIGHT

> A(c) As the motor launch takes visitors into the lagoon, curving lines of light fall from the bow.

Note that in the passage just presented, clause merger and clause splitting are both involved. The adaptor must weigh the advantages and disadvantages of these complementary processes, because producing a readable text at a given level is not the same as producing a text which scores at that given level of readability. A tension is inherent in the adaptation between the need to shorten, and the need to clarify, between the need to simplify structure and lexicon, and the need to add indications of cohesiveness to the text. Therefore, no one of these strategies can be employed in isolation. Clause splitting shortens average sentence length, but may obscure relations between the parts. Clause merger, while tending to add to text cohesiveness, might also complicate syntax. However, readability formulas are not sensitive to such considerations.

The amount of clause splitting or merger found in an adaptation probably varies with the target grade level of the text, the length of the O text, and even the nature of the text (expository, narrative, etc.), as well as the adaptor's judgment. Any given process will also be quite dependent upon the amount of material deleted, and will vary in proportion to complementary processes. At the present stage of investigation, it is impossible to evaluate precisely the effects of these adaptive procedures on text comprehension. Clearly, the adaptor tries to preserve content while changing sentence structure. But sentence structure itself conveys information, as do the conjunctions used, so that changes of structure may subtly distort and obscure the original content. We suggest that research be done which investigates the consequence of conjunction deletion and consequent clause separation for reading comprehension in general and for making proper inferences in particular.

Clause Restructuring for Effect in Discourse

In this section, changes will be discussed which affect the syntactic structure of the sentence, but which are not directly connected with the clause splitting or merger. The changes to be discussed here primarily affect the word order of the sentence, particularly in the cases where the rules of the language allow the user some choice. In transformational terms, word order and consituent structure can be changed by the application of optional rules, such as Adverb Preposing, Passive, and There-Insertion (see, for example, Bach, 1974). The transformations relate equivalent surface structures, yet the supposedly equivalent surface structures are often perceived as expressing somewhat different messages, and the differences can be traced to what constituents are placed in topic position, before the verb, or in focus position, at the end of the sentence. We are not considering topic and focus to be underlying syntactic or semantic categories. Topic is a broad term covering several different notions (cf. Chafe, 1976), but in English and similar languages, the NP constituent in subject position is usually perceived as the sentence topic in declarative sentences, all other things being equal (e.g., the specificity or referentiallity of the NP). Likewise, the position at the end of the sentence is often exploited by a speaker or writer to indicate the focus of the sentence, or what is new or asserted information in a statement. The constructions and rules discussed in this section all can be used by the speaker or writer to manage the match between the obligatory features of the sentence (word order and the indication of grammatical relations between the parts) and the discourse-related topic and focus portions of the sentence. The common properties of these examples are (1) that choices in syntactic structure are allowed by the grammar of the language, and (2) that these choices can be exploited to convey extra-syntactic information about topic and focus.

Adverb preposing. It is a striking feature of the adapted texts studied here that the majority of adverbs of cause, place, and time, clauses as well as phrases, occur in initial position in the sentence, often set off by an intonation break or its written signal, a comma. The texts show a tendency to shift adverbials from post-verbal position to initial position, as in (23) and (24), if they are not in that position in the original, as they are in (25).

(23) MILK

O And a certain special use was recently discovered for skim milk.

A Recently a surprising use was discovered for skim milk.

Recently is shifted to sentence initial position in the adapted version, with no change in word order or complexity.

(24) DAYTON

O At half past eight there was a big yelling up the street, and---crack!

A Then up the street we hear a big yelling and a crack.

(25) TREES

O When the Sequoia is very young, branches often cover it from the ground to the top of the tree. As it grows older, the lower branches drop off. Finally the nearest branch may be more than a hundred feet off the ground.

A As the Sequoia grows, the lower branches drop off. Finally the nearest branch may be more than a hundred feet above the ground.

In (24), the replacement of the initial time adverbial At half past eight and the merger of the two coordinate clauses into a single clause with a conjoined NP object produces a much simpler and shorter sentence to which Adverb Preposing applies, for reasons which will be discussed later in more detail.

(26) LIGHT

O Curving lines of light fall from the bow as the launch enters the lagoon, and a trail of light is left in the boat's wake.

A As the motor launch takes visitors into the lagoon, curving lines of light fall from the bow. A trail of light is left in the wake.

(27) LIGHT

O Motor launches take visitors into such a lagoon located on the southern coast of Puerto Rico where on dark nights there is a dramatic display of bioluminescence.

A On the southern coast of Puerto Rico is a lagoon that has one of the greatest amounts of bioluminescence in the world. On dark nights, it creates a very dramatic display.

In (26) and (27), Adverb Preposing applies in conjunction with sentence splitting. It moves an adverb which has become sentence final as a result of splitting.

The placement of an adverbial clause in initial position has several different effects, depending on whether the structure is the result of application of an optional syntactic rule or of more far-reaching sentence restructuring. Most generally, the initial position, especially if a comma signals an intonation break, is an unambiguous marker of subordinate structure. This is particularly valuable in left-to-right surface structure parsing, because the appearance of an initial conjunction marks what follows as a subordinate clause, especially in the adaptations where initial and and but are deleted. The intonation break (often indicated by a comma) identifies the end of an embedded constituent. In sequences of the form clause-conjunction-clause, there is no marker which shows where the first sentence ends; a conjunction such as and might be part of a conjoined NP rather than the marker of the boundary of a second clause. Nothing indicates whether the second clause is subordinate. Basically the only clue is in the conjunction used. There is some evidence from psycholinguistic experiments that indications of subordination are expressed in multiple ways (e.g., complementizers, selected constituents, clause position; Kornfeld, 1973; Townshend & Bever, 1977). Thus where no other motivation might exist, adverbs can be preposed merely to make the sentence structure easier to interpret on the basis of surface form.

A second effect of placing an adverbial at the beginning of the sentence is to remove it from focus position at the end of the sentence. In focus position, an adverbial could be focused and thus could be negated or questioned as in the following hypothetical cases:

(28)

a Will you get the car fixed on Saturday?

b On Saturday, will you get the car fixed?

(29)

a John didn't leave because he was tired.

b Because he was tired, John didn't leave.

Examples (28)a and (29)a have two interpretations. In one reading the whole proposition is questioned or negated. In the other reading, the question or negation is limited to just the adverbial which is in focus position. The rest of the proposition is not questioned or negated; in fact, its truth is taken for granted. In (28)b, on the other hand, the adverbial is not questioned, and the because clause in (29)b is not negated. The preposed adverbials are just taken as background given information and cannot be questioned or negated (Lakoff, 1971).

We found no instances of ambiguities of questioning or negation in the original texts, and would not have expected that either the original writer or the adaptor would allow such pernicious ambiguities to remain in written texts (although they abound in spoken language). But in the case of statements, it seems to be advantageous to remove a post-verbal adverbial to initial position simply to make clearer what is focused in the predicate of the sentence and what is background, scene-setting information. The adaptor of (30) condensed one adverbial into another so that the originally postposed temporal (relative) clause could be made into a preposed time adverbial clause:

(30) MILK

O In this country, milk has been flowing since 1611 when the first cows were brought to the Jamestown Colony.

A When the first colonists sailed for America, they made room for cows on their crowded ships.

in this country has been more or less transmuted into America and incorporated into the when clause, which itself was constructed out of a relative clause modifying 1611 in a post-verbal time adverbial. All the adverbials have been moved out of focus position except for on their crowded ships, which is closely linked semantically to make room and thus may be deliberately kept in focus position.

We might contrast the sensitive exploitation of syntactic choices for discourse purposes with a case where the choice of material in focus position seems to have gone somewhat awry:

(31) LIGHT

O This small sand-dwelling animal emerges at night and secretes a luminous mucus as it moves about.

A This small animal, which lives in the sand, comes out at night. As it moves about, it secretes a luminous substance.

Adverbial preposing does take place in the adaptation, but other adaptive processes change the syntactic structure as well. In fact, this sentence is an interesting example of what we suppose to be a "domino-effect," a sequence of one change requiring another. The original sentence contains three clauses, just about the upper limit (see clause complexity discussed in Clause Splitting). The prenominal modifier sand-dwelling is turned into a full relative clause, which lives in the sand. The sentence would now have four clauses, so it is split into two sentences of two clauses each. The post-verbal as clause in the second sentence is then preposed to make clearer what is focused in the predicate, the luminous substance, the theme of the paragraph. The predicate of the preceding sentence is itself exposed to focus, however, and for this reason sounds like a non-sequitur. Since the paragraph, and indeed the whole article, is about things that glow in the dark, one would expect that the fact that something comes out at night would be given or expected information, and not something to be asserted with any emphasis. Though Adverb Preposing is not directly responsible for what is in focus here, this example does provide a clear illustration of what focus position means in discourse. The example also illustrates a point made earlier about the effect of sentence boundaries on what information the reader may perceive as related or separate, prominent or placed in the background.

Active and passive sentences. Some syntactic processes affect the choice of what NPs are in subject position in a sentence. In terms of transformational rules, application of an optional transformation such as Passive places a direct object in subject position, and therefore in topic position. If the choice of not applying Passive is exercised, then the underlying agent is retained in subject and topic position.

Passive sentences have often been accused of being harder to process semantically than the active sentences which correspond to them (Slobin, 1966). This ought to be true, because the grammatical relations of subject, non-subject, etc., indicated in the surface structure, do not match the logical relations which the reader must eventually reconstruct.

However, since subject position has been argued to be the most favorable position for the sentence topic, the fact that the object is in topic and subject position may in fact facilitate the flow of the discourse if the topic of discourse at that point is the underlying object and not the underlying agent. An individual sentence might require more effort in interpretation simply because it is passive in form, all other things being equal, or if there is no context. The discourse, however, may be easier to comprehend if subject position is consistently used to define what is the topic of the sentence and of the discourse (cf. Gourley, 1978; Gourley & Catlin, Note 3). We assume that a sequence of sentences in a paragraph can be related as mutually relevant, so that "topic of S_1" may be generalized by the mature reader at least as "topic of this sequence of sentences including S_1."

For example, the following changes from active to passive form and vice versa were probably made to change what is in topic position:

(32) TREES

O By counting the tree rings and measuring the stump, it was found that one old giant had increased its thickness by only 10 feet in more than 1,600 years.

A When the tree rings of one old giant were counted and its stump measured, it was found that the tree had increased its thickness by only ten feet in more than sixteen hundred years.

The agent in (32)O is unspecified and not expressed in either clause of the sentence. By definition this kind of agent cannot be the topic, and by rights, the topic ought to be the properties of the trees. The original form of the sentence is also somewhat opaque to parsing, since an unexpressed agent has to be recovered for the active clause introduced with by, and for the passive main clause.

By making the two subordinate clauses and the main clause passive in the adapted version, the adaptor gives the reader several useful clues. The topic is in subject position, and the agent, which is not the topic, is the same in both cases. The parallel structures ought to suggest this even to a non-mature reader who cannot be expected to reply to all the invitations to make an inference. Other examples are:

(33) TREES

O Lightning causes most of the fires, but long ago the Indians sometimes set fire to the grass and needles on the forest floor. . . . All of the Big Trees have been struck by lightning at least once.

A Most of the fires are caused by lightning. (Three sentences deleted.) All of the very old trees have been struck by lightning at least once.

(34) MILK

O Early Hebrews used laban, or curdled milk, to drive away sickness from the body and there are some fifty references to milk or milk products in the Bible.

A Milk is often mentioned in the Bible.

In (34), the adapted version substitutes a verb for the nominalization reference. The paraphrase is in passive form, in order to establish milk as the topic, rather than the Bible or the early Hebrews, as in the original.

Since passive sentences are in fact somewhat more complex to parse than active structures, it is not surprising to find cases where passive sentences in the original versions are replaced by non-passive, intransitive sentences. These sentences keep the topic in subject position but do not suggest that there is some unexpressed agent to be identified. Such is the case in example (35):

(35) MILK

O Milk gradually became celebrated in Europe for its supposed medicinal qualities, particularly when, a watery serum separated from the curd after coagulation.

A In the Middle Ages, milk was still popular as a medicine.

This change is made possible by substituting one lexical item for another, presumably more familiar one, but there is no reason why the change from passive-transitive to intransitive verb had to take place merely to simplify the vocabulary. Milk became celebrated for could have been paraphrased as Milk was widely used as instead of Milk was . . . popular as . . . Since passive sentences have many of the same properties as sentences with intransitive verbs (Lakoff, 1977) and since passive structures are more difficult to parse than active structures, it is to be expected that many instances of passive structures will be avoided.

There in subject position; there-insertion. In English, a sentence may begin with an "expletive" or "non-referring" or "existential" there, in subject position, and the subject with which the verb agrees follows the auxiliary verb or copula be. The surface structure thus contains conflicting clues as to what the subject is. It is harder to parse than an ordinary sentence with the grammatical subject in subject position. So unless such a structure serves some purpose in discourse--for instance, displacing something which is not the topic from topic position--removal of there ought to make the sentence somewhat more readable. Some instances of there with be and an indefinite subject are eliminated in adaptation:

(36) DAYTON

O Just then the big planks began to come . . . . There was a big, heavy lamp-post in front of the house, and I saw one of those planks come down against it, and in a second that big iron post doubled over like a wet weed.

A Big planks were coming now. One of them hit the heavy lamppost in front of the house and it doubled over like a wet weed.

There is used to assert existence of something which is not the topic. In the adapted version, just the mention of the heavy lamppost in front of the house implies the existence of a thing of that description. A similar change can be seen in example (37):

(37) DAYTON

O Next morning--Friday--there was the top of the iron fence again, and by noon the lawns were showing.

A On Friday morning the top of the iron fence showed, and by afternoon the lawns appeared.

The topic is shifted from the times--if that is the purpose of the preposed adverbials in combination with there--to the things which indicate that the waters are receding. The removal of there seems to have the effect of making it clearer that the fence and the lawns have some great significance.

In contrast, in some instances there is inserted in the adapted version to assert the existence of NP referents although they do not necessarily become topics:

(38) LIGHT

O About 40 major groups of organisms and uncountable species are capable of bioluminescence.

A There are about forty main kinds of organisms which produce bioluminescence.

In both cases, a description of some of the organisms follows. In the adapted version of MILK, there is also used to list the products made from milk, none of which becomes a topic in its own right later in the text:

(39) Milk

O . . . soft curd milk, in which the curd is softened to aid digestion by boiling or other methods; fortified milks, with vitamin D or other nutrients added; concentrated milks, condensed, evaporated, frozen, or dried; skim milk, from which most of the fat has been removed; cultured milks, like buttermilk, the by-product from the churning of sour cream into butter; acidophilus milk, with a bacterial culture added to aid digestion, and yoghurt, a custard-like brew of whole milk fermented by a bacterial culture.

A There is soft curd milk, in which the curd, or solid part, is softened to make it easier to digest. There is skim milk, from which most of the fat has been removed. And there is buttermilk, which is the by-product formed when sour cream is churned into butter. Finally, there is yogurt, whole milk that has been partly evaporated and then fermented by bacteria.

Reordering of clauses and "natural" order. As we observed earlier in our discussion on clause merger, there is a "natural" order to clauses, so that the clauses are uttered in the same order as the events they describe. When clauses are conjoined with and, or, or but, the first clause is generally assumed to refer to an event prior to the second (Grice, 1975, Schmerling, 1975). People often prefer the order which corresponds to the order of events referred to, regardless of the information contained in the conjunction, if, before, after, because, etc. (Linde, 1976).

Preposing an adverbial clause or leaving it in post-verbal position may be one way of making the order of utterance match temporal and causal order. As we saw earlier concerning mergers, the order of clauses may be simply reversed, with the appropriate changes in syntax. There are examples of separate sentences produced by clause splitting which are also switched in order:

(40) LIGHT

O Their dried bodies can be ground into a powder which will produce light when mixed with water.

A Their dried bodies can be ground into a powder. When the powder is mixed with water, it will produce light.

The when clause describes an event which precedes and is necessary for the state described in the second clause, in the adapted version. Similarly:

(41) LIGHT

O If you dip a bucket of water and bring it aboard the launch, you can see the light roll away from your hand when you put it in the water.

A If you dip a bucket of water and put your hand in it, you can see the light roll away from your hand.

One less essential clause (and bring it aboard the launch) has been deleted and replaced by the postposed clause when you put it (your hand) in the water. Again, in the adapted version, the event referred to by the first clause is a precondition for the event described in the second, main clause.

Earlier we noted (cf. examples (8) & (9) above) that deletion of material seems to produce an intermediate stage which undergoes further changes, like merger. Similarly, single phrases may be expanded into clauses, which then undergo reordering:

(42) DAYTON

O So Jack went off, in rubber boots, keeping close to the fences.

A He put on rubber boots and set off.

The postnominal modifiers in rubber boots has been expanded into a full clause describing how Jack came to have on rubber boots, and it has been placed in an order of utterance reflecting the fact that the event took place before Jack left.

The correspondance between order of utterance and temporal order seems to be a very powerful one that is found in many and probably all languages. It is something which speakers and hearers may assume unless there is explicit information to the contrary; in fact, to utter the clauses in an order not reflecting the order of events referred to is to mislead the hearer quite deliberately. The expectation that order of utterance conveys information about the events referred to is one which younger children are probably familiar with, though their own utterances are not necessarily governed by it. Being consistent in observing the order of utterance convention is part of learning "considerate" speech (Kantor, 1978) which offers clues to correct intended interpretation over and above observance of the rules of grammar. We might speculate that adaptors of texts are aware of the information available in the ordering of clauses, and make use of it to assist the reader in finding the correct semantic interpretation.

Paraphrase and condensation. There are instances in the 0 versions of passages that contain salient content, but which are felt to be too difficult for the intended readers and so must be reworded. The rewording results in structural changes in the adapted version, while retaining essentially the same message. This category, therefore, typically constitutes a strategy of structural simplicification. An excellent example of this is shown by the following excerpt:

(43) TREES

O When a Big Tree falls, its needle-like leaves do not wither for years.

A When a big tree falls, it takes years for its needlelike leaves to wither.

In O, the main clause contains an odd sort of negation that is fairly difficult to process, even for adult readers. One might expect the negative to negate the verb, but it does not. Rather, it negates the constituent following the verb, the adverbial clause for years. The A version removes the negative particle entirely, using instead an extraposed sentence with a dummy subject (it) and something resembling a purpose clause introduced by for. Still, A seems considerably easier to process, primarily because it lacks the problem of negative scope contained in O.

Occasionally, the original text will contain a large number of events or details which the adaptor deems too numerous, but which he wishes nonetheless to summarize in order to maintain the essential message of the passage. Details may be synthesized into one general statement which can cover all of them. Synthesis is particularly common in such adaptations as DAYTON where individual events may be summarized or omitted completely without changing the basic sequence of events. In the following example, the lengthy O passage contains a number of individual actions, of varying impact and importance; the A version synthesizes the events succinctly, leaving out much of the dialogue, but retaining the central actions.

(44) DAYTON

O "My God!" said Jack. "It is a man. I'm going out after him."

But I screamed, and Mr. Shoyer grabbed him and held him back. And Mr. Shoyer said:

"Hold on, Jack, they're going to get him next door." And they did.

They got him into their parlor, and he stood there with the water up to his waist. And then the people next door began saying to him:

"I don't see how we can keep you here, we've got such a lot of people in the house now."

"Excuse me!" said the fellow. "I'm not asking you for shelter; all I ask you is to let me rest till I get my strength, and then I'll go on."

So after a while he took off his coat and stepped out on the windowsill and looked at the water. Then he shivered, and said:

"Oh, I can't go into that again!" The water was just like ice water.

"You come over here, Mr. Man," said Jack.

So he reached out his hand (the houses were close together there), and Mr. Collopy grabbed Jack's hand, and Jack waded out and grabbed the man's, and they pulled him across . . . .

A "It is a man!" Jack screamed. "I'm going afer him!" But the people next door rescued him first. Their house was crowded, so they sent him to ours . . .

Of particular interest is the way in which several of the above sentences are paraphrased:

(44')

O "They're going to get him next door." And they did. becomes:

A But the people next door rescued him first.

Elimination of a direct quote is but one of the many devices employed in such paraphrases.

Expansions. Although the general tendency in adaptation is to reduce the average length of sentences and to condense the text somewhat to offset the lengthening which paraphrases may create, there are examples of expansion of reduced clauses and other constituents. The purpose of expansion is probably to fill in information which might be quite obvious to an adult reader who has more knowledge of things in the world than children normally might be expected to have. In the O version of example (45), the phrases during blackout night action and near the enemy may not convey enough information for the reader to understand how the components of the sentence are related:

(45) LIGHT

O In World War II, Japanese naval officers during blackout night action near an enemy moistened the powder in the palms of their hands and read their navigation charts in the dim blue light that was produced.

A During World War II, Japanese naval officers used this powder. When they were close to the enemy during blackout night action they moistened the powder in the palms of their hands. They could read their navigation charts in the dim light that it gave.

The splitting of the original sentence into several sentences creates a potentially disconnected sequence. Thus it is of special value to have a full clause, when they were close to the enemy, with a pronoun they by which the reader can infer a link to the immediately preceding sentence. Furthermore, the restructuring as a time adverbial removes a possible misreading, namely, that the reading of navigation charts took place at the same time but not necessarily the same place as blackout night action. This reading is far-fetched if one has full background knowledge, but not if one is depending simply on the information available in the sentence alone. During blackout night action near an enemy indicates only where the action is, not explicitly where the naval officers were.

Content

As we have already mentioned, the two major tasks of an adaptor are to reduce the length of the original text and to make the text appropriate for the intended reader. Both of these considerations are reflected in changes in content, or the information to be conveyed and interpreted. In this section we will specifically deal with deletion and addition of information represented by words, phrases, sentences, and longer sequences. We have attempted to subdivide content changes on the basis of the communicative function of the deleted or added material.

In assessing communicative function, we have assumed that it is legitimate to talk about the notion of discourse topic. We do not assume that topics need to be explicitly stated in a passage, though often there are statements, called "topic sentences" by many, which function to shape the reader's expectations of what is to follow. Topical information itself is a necessary constituent of a text, but only because talking or writing topically is part and parcel of being cooperative and rational. More discussion of this notion can be found in the section on Organizational Information below.

We also assume that topics, or perhaps more generally concepts, are introduced in a text and elaborated on in various ways. In the subsections on Elaboration and Thematic Information, we discuss processes by which the adaptor reduces the passage length. We may view the organization of at least some expository writing as having sections (sentences or larger chunks) which may serve to elaborate on a topic, which in turn may elaborate on a larger topic, and all of which finally serve to comprise the topic of the entire passage itself. In some cases an entire (sub)topic may be deleted; in others, a smaller unit may be deleted.

But while we talk as if some texts have a kind of hierarchical structure to them, we do not mean to be proposing a theory or model of expository structure. There are too many possibilities for the construction of texts for us to believe that a structural model on the analogy of a grammar for sentences can succeed. For example, two so-called sections might be connected by what we call a "topic channeling device," which indicates transition between two essentially independent topics.

In general, we will attempt in this section to establish what types of information are deleted or added in these adaptations and what motivations there might be for the changes. Below we present examples of deletions and additions for each of eight categories: modality, basis information, organizational information, elaboration, connectives, referential connection, thematic information, and definitional information. We will now take up each of these categories in turn.

Modality

The term modality encompasses those words and phrases which communicate information concerning the truth-value of a proposition, the factuality of an event, or the conditionality or likelihood of an event. Included under this heading are modal auxiliaries like can and may, and certain attitudinal adverbs like supposedly. Also in this category are phrases expressing the source of a particular statement: who asserts a particular proposition is certainly crucial to the degree to which a proposition is believed true or factual (see also under Point of View below).

We have found both deletion and addition of modality information in the adapted texts under study. Deletions occur more often than additions. We now present some representative examples with discussion.

One possible motivation for deletion of modality information is that the adaptor may believe that children's text ought to be "fact" oriented. Perhaps it is thought that the material is complicated enough without the further complication that the "facts" are not really facts, but rather assertions of conditionality. Since modal items tend to render propositions or events less than 100% certain, the adaptor might delete them for this reason, as in (46):

(46) MILK

O. Nero's wife, Queen Poppea, took a daily bath in it (= milk) and supposedly had 500 beasts on tap for the purpose.

A. She kept five hundred animals to make sure of having enough milk each day.

The attitudinal adverb supposedly is used by the author to express some degree of doubt about whether Poppea really did have that many animals on hand. The adaptor here has chosen to remove any doubt.

A similar example is (47):

(47) LIGHT

O. Apparently, too, most of these fish can control when they flash their lights in the dark waters where they live.

A. Most of these fish can control the flashing of their lights . . .

As with the previous example, the adverb apparently here expresses some degree of doubt about the proposition it modifies or has scope over. The deletion of this modal information allows the reader to interpret as fact the proposition that the fish do have the ability to control the flashing.

It is quite possible that for both examples (46) and (47), the attitudinal adverb was deleted because it is unfamiliar. Neither apparently nor supposedly appears on the Dale-Chall list (Dale & Chall, 1948), for example. Or, perhaps the adaptor does not consider the conditionality of the propositions to be important. Whether these deletions of modal elements are indeed appropriate in adaptations depends, in our view, on two outcomes: first, the results of developmental research to determine whether or not children reading at a particular level can understand and make use of modal notions; and second, opinions from reading educators on the desirability of fact/contingent fact/opinion differences in material for different levels.

In the next example:

(48) TREES

0. A railroad freight agent has figured that it would require at least 40 modern flat cars to haul just the trunk alone.

A. And at least forty freight cars would be needed to haul away just its trunk.

what has been deleted is a description of the source of a claim, a knowledgeable authority. The adapted version does not provide the reader with any basis by which to judge the accuracy of the claim (see also the section on Hedged expressions).

Another example:

(49) TREES

0. But if a fertile seed happens to fall on freshly upturned soil, it will begin to grow the next spring.

A. But if they fall on freshly turned soil, they will begin to grow the next spring.

The verb happens (to) functions to emphasize the chanciness of this event (the seeds growing). Note also that the adjective fertile in the original, which is also deleted, contributes as well to this uncertainty in that it adds another precondition to the seeds' growth.

Addition of modality information is not an expected type of change, for the adaptor would be imposing his own beliefs on the text by qualifying or making conditional something which the original author has not. However, we did find some examples of modality additions. One of them:

(50) DAYTON

O. The whistles kept blowing and blowing. We couldn't understand it . . . . It was a little after six, still kind of gray.

A. The whistles kept blowing and blowing. We couldn't understand it . . . . It was only a little after six o'clock in the morning.

In this example, only functions to emphasize the unlikeliness of this particular event happening at this particular time. This unlikeliness is already expressed in the second sentence of both versions; thus the adaptor is not adding the element of unlikeliness here, but merely emphasizing this aspect.

Basis Information

This category consists of assumptions and explanations necessary for an accurate interpretation of the facts which the author of the original presents. The deletion of this information may result in a mistaken inference being made in the worst case, or in an incomplete interpretation of the facts if no inference is made at all. Some examples:

(51) TREES

O. It contains enough lumber to build a good sized village. Or, if the General Sherman Tree were sawed into inch boards, it would make a box large enough to hold the greatest ocean liner ever built.

A. It contains enough lumber to build a good-sized village. It would make a box large enough to hold the greatest ocean liner ever built.

Example (51) poses an interesting question. With the deletion of the information about the sawing into boards, might the reader infer that the General Sherman Tree in and of itself is so big that an ocean liner would fit inside the trunk? Without the if-clause, real world knowledge must be brought to bear to properly interpret the original author's intent.

(52) TREES

O. Thousands of Big Trees were destroyed by axe, by saw, and by dynamite. The saddest part of the whole story is that only a part of the trees destroyed were ever cut into lumber . . . In many cases the fallen giants were blasted with dynamite to get pieces small enough to handle.

A. Thousands of the big trees were cut down and cut up. Often they were blasted with dynamite into pieces small enough to handle.

In example (52)A, might not the reader infer that the sequoia trees were blasted with dynamite to get them to fall in the first place? Example (52) is particularly interesting, for it shows the difference between what might be called descriptive (merely elaborative) and definitional (providing a necessary specification) modification. Had the original underlined phrase been the doomed giants, the replacement of the subject by the pronominal they would have had little effect on the factual content of the message. Doomed, while perhaps expressing the author's attitude toward the destruction of the trees, is incidental information. Without this adjective, the core proposition expressed remains the same. With fallen as a modifying adjective, however, there is quite a difference. The predication of dynamiting is made of "fallen trees." Thus this adjective functions as definitional of the concept of which the predication is made. (Descriptive adjectives like doomed are discussed in the Qualification section below.)

Another example of the deletion of basis information is in (53):

(53) LIGHT

O. Angler fishes, among the most unusual of luminescent fishes, have fingerlike extensions which dangle in front of their large, gaping mouths. Fishes attracted to these lights in the darkness are easily caught and eaten.

A. Angler fishes have fingerlike lights which they dangle in front of their large, gaping mouths. Fishes in the darkness are easily caught and eaten.

Here, how can the reader help but understand the adaptation as conveying that the angler fish has "headlights" with which it spots fish in dark waters? The function of the modifying phrase attracted to these lights is quite similar to the function of fallen in the previous example, although here there is perhaps an even more complex relation between the modifier and the rest of the sentence. In addition to conveying that the fishes eaten are just those that are attracted to the lights, there is a (probably intended) implicature that these fishes are caught and eaten because or as a result of being attracted to the lights. The deletion of this modifying phrase, then, results not only in a misinference being made, but also in the loss of a somewhat subtly expressed causal relationship that is characteristic of literate language use. A sentence such as the original would provide a fine basis for testing whether the causal relationship is inferred.

There are two examples in MILK where basis information is added.

(54) MILK

O. Nero's wife, Queen Poppea, took a daily bath in it and supposedly had 500 beasts on tap for the purpose.

A. The wife of one emperor of Rome took a milk bath every day. She believed this would improve her health and beauty. She kept five hundred animals to make sure of having enough milk each day.

(55) MILK

O. In Toronto, a suburban ice-skating rink was flooded with 250 surplus gallons of it (= skim milk). Skaters found it chipped less easily than frozen water.

A. An ice skating rink was flooded with it. Skaters found that when it froze it chipped less easily than frozen water.

The addition of the sentence in (54) makes explicit why the empress took a milk bath. The phrase when it froze in (55) makes explicit that we are comparing frozen skim milk to frozen water. Again, it is an open question whether these inferences would be made without the addition of this information, but the adaptor's inclusion of such information suggests that he at least believes this to be a potential problem. (For comments concerning the deletion of the adjective surplus in (55), see the Qualification section below.)

We feel that basis information must be attended to carefully when dealing with adapted material. The difference between the functions of the adjectives in (51) and (52) and those definitional adjectives presented in the Qualification section below is clearly quite important, and a "rule" of adaptation such as, "you can delete adjectives," will not do.

Organizational Information

In this section, we will delineate the functions of certain types of organizational information: topical information, summary or interpretive information, and topic-channeling information. Under topical information, we will discuss only explicit expressions which communicate something about, or frame, what is to be discussed, i.e., something like traditional topic sentences. A summary or interpretative statement provides information encompassing or reiterating the topic or goal of the passage or particular subpart of the passage, but not replacing it. Topic-channeling information provides a transition between differing subparts of a passage.

We assume that the primary function of organizational information is to structure the incoming information for the reader. Thus, we would expect that in deciding whether or not to delete or add organizational material, the adaptor's criterion would be whether or not the topic/point of the passage is obvious (i.e., can or cannot be easily inferred). But, as we will show, there are other complications.

Our first example is of the deletion of a topic sentence in (56).

(56) TREES

O. If the life story of a Big Tree could be told in full, it would read like a wild adventure tale. The Giant Sequoia produces seeds every year. It blooms . . . .

A. The giant sequoia produces seeds every year. It blooms . . . .

The first sentence of the original, the topic sentence, is the beginning of five paragraphs about the life cycle of the sequoias. The corresponding material in the adaptation is two paragraphs long, but those paragraphs contain information from parts of each of the original five. Does the deletion of the framing sentence make any difference for comprehension? Note that the corresponding adapted passage begins immediately with a description of the first step in the cycle of growth. Thus, the reader will have to infer that this sentence begins a subsection about the cycle of growth. If the inference is not made here, the reader would have to read further before understanding what the point of the passage is. Given correct recognition of the topic sentence, this inference would presumably not need to be made, i.e., the reader would *expect* what follows to be about the growth cycle of the trees.

The topic sentence may have been deleted because the phrase, "read like a wild adventure tale," is rather overstated. We would suggest, however, that there are options other than deletion available to the adaptor. The adaptor could have replaced the "wild adventure tales" sentence with something like *The life story of the big trees is as amazing as their size*, since size of the trees had just been discussed.

The second example of deletion of topical information involves a noun phrase rather than a sentence:

(57) MILK

0. Among the products sold here are: whole milk . . .; homogenized milk . . .; skim milk, from which most of the fat has been removed; cultured milks, like buttermilk, the by-product from the churning of sour cream into butter; acidophilus milk, with a bacterial culture added to aid digestion, and yogurt, a custard-like brew of whole milk fermented by a bacterial culture.

A. Milk comes in many forms. It is often sold homogenized. . . . . There is skim milk, from which most of the fat has been removed. 0 And there is buttermilk, which is the by-product formed when sour cream is churned into butter. Finally, there is yogurt, whole milk that has been partly evaporated and then fermented by bacteria.

We classify cultured milks as topical information because it provides an intermediate category: in the original text, cultured milks appears in a long list of types of milk, with three examples under it. There are several possible motivations for deleting the (sub)topical reference to cultured milks. Perhaps the adaptor believes the word cultured is not familiar in this usage. Perhaps the choice of the adaptor to delete entirely the example about acidophilus milk led him by the "domino effect" to delete the subcategory because there would now be only two examples of the cultured milks left and the subtopical information would thus have less scope. Or, perhaps the adaptor chose to delete the phrase because there is no other such intermediate category given in the original.

Next we come to the deletion of topic-channeling information, as in example (58):

(58) TREES

O. For a while, the Calaveras Grove, discovered by Dowd, was believed to contain the only Big Trees in the world. The belief was wrong, as later events proved. In all there are about seventy more groves of these trees. They are scattered up and down the western slop of the Sierra Nevada, but the finest and largest are found within one small area. Thirty-two different groves, containing more than one half of all the Big Trees, stand within Sequoia National Park.

A. Ø In all, there are about seventy groves of giant sequoias. Ø Thirty-two different groves stand within Sequoia National Park. The largest, the Giant forest, contains the big trees in every stage of growth, from tiny seedlings to sky-piercing giants.

(The last sentence in the adapted paragraph has been brought in from a different part of the original passage.) There are other differences between the two versions, but we will discuss here only the underlined sentences in the original, what we call the topic-channeling devices. The first two sentences of the original serve as a transition from discussion (in the previous paragraph) of the discovery of the trees to the topic of the number of groves. These two sentences communicate information that can be used to establish the topic of the paragraph. Since a premise (that only one grove existed) is set up and then denied, what must come next is the reason for denying the premise, i.e., the assertion about the total number of groves.

Similarly, since the author has spoken about the total number of groves, it is reasonable to add information about their location (scattered up and down the Sierra Nevada), and then contrast the scattering over a wide geographical area with the remark that a particular subset contains the finest and largest groves. This then "legitimizes" or makes relevant the statement of fact that so many groves are in Sequoia National Park.

There is nothing in either the original paragraph or the adapted one that can be called a topic sentence. In the adapted version, however, there is no connective material. There is simply the statement of three facts, two of them seeming to emphasize the number of groves.

Examples like this one lead us to pose the following questions for research. Are channeling devices like these used by children to integrate information? If these devices are used, do they occur very much in children's texts, or do writers of such texts believe that such devices are "above the children's heads"? If children can understand these devices and make use of them in interpretation, and if potential use of these devices is not made, then is it the case that children get the idea early on in reading expository prose that such prose consists of "facts" only?

Next, let us look at cases where organizational information has been added in the adaptation. As stated above, we would assume that such material would be added when the topic of the paragraph or the connection between parts is not easily inferable. However, consider the example below, where a topic sentence has been added:

(59) MILK

O. Milk, on the average, is composed of 87 per cent water, 4 per cent fat, and 9 per cent nonfat solids, of which . . . .

A. Just what do all these milk products give to the people who use them? Milk is about 87 per cent water. But the solid part . . . .

The adaptor has added a topic statement in the form of a rhetorical question. This serves not only to make the topic explicit, but also involves the reader more in the text by addressing him via a question (see also Point of View) and possibly makes the facts more relevant or interesting to the reader by stating that he benefits from the product. But it is not clear that the topic in the original version is particularly difficult to infer. Motivation for adding the topic sentence seems more likely to come from interest level than topic clarification.

Next, we have an example of the addition of summary-interpretive material:

(60) MILK

A. . . . A picture of milking has been found in the ruins of an ancient city. It was drawn about 3500 B.C. Milk is often mentioned in the Bible. For example, there is the famous description of Canaan as a land "flowing with milk and honey." "Flowing with milk and honey" is an expression that means "rich in things to eat." This shows what an important food milk was thought to be in ancient times.

In the original text, many other examples of ancient references to milk are also included in order to develop the topic of milk being old, but there is no sentence such as the one underlined in (60). By adding this sentence, the adaptor has summarized the time reference of all the examples as ancient times and has given an interpretation of the facts listed in the paragraph.

Finally, let us look at an example of the addition of a topic-channeling device:

(61) TREES

A. . . . . They were stately giants when Christ was born. Yet not many years ago the sequoias came close to being destroyed.

The destruction began soon after the big trees were discovered.

The underlined sentence serves as a transition between two topics ("longevity" and "destruction") concerning the sequoias by overtly putting them in an adversative relationship, using yet.

In the original text, these two paragraphs are not juxtaposed; the paragraph on destruction occurs after paragraphs discussing the discovery of the big trees. The third sentence in the example above is also added in the adaptation, functioning as a topic sentence for the paragraph it begins. In the original version, the paragraph on destruction begins:

O. In the meantime, the discovery of the Big Trees had attracted wide attention.

Thus, the adaptor has not only added a transition between topics in this example, but has also made one of the topics explicit.

The fact that topic-channeling information has been added shows that the adaptor was not rewriting the material mechanically; he or she conceived of the adaptation as a text with a structure in its own right. But if the adaptor had not done this, and had just altered the order of topics, there would have been an abrupt and possibly confusing topic shift, a problem which the adaptor had foreseen.

Elaboration

By elaborated information we mean any information that expands on the topic under discussion or the event being described. We fully expect that more investigation into text structure and the communicative function of sentences in discourse will lead to a taxonomy of elaboration types. For the purposes of this study, however, we leave the category broad and loosely defined.

Exemplar information. One subtype of elaborational information, and probably the most prototypical type, is exemplar information. Exemplar information functions to provide an instance of a concept/topic or evidence for a claim.

There are many cases in the adaptations where examples have been deleted, but none where such information is added. This is to be expected, for the adaptor would have to depart from the original text to add material based on his knowledge of the topic being described.

Deletion of examples can have a variety of motivations. Doubt about the reader's world knowledge is the most obvious explanation for the deletion of the example information in (62):

(62) TREES

O. Without doubt, the Giant Sequoias are the oldest living things in the world. They were old when Columbus discovered America, and when the ancient cliff dwellings of the Mesa Verde came into being. They were stately giants when Christ was born, and good-sized when David went out to do battle with Goliath.

A. They were old when Columbus discovered America. They were stately giants when Christ was born.

The assumption here is that while children probably know the time references for Columbus and Christ, the references to even the existence of Mesa Verde and the time of David and Goliath are most likely unknown. We have found a number of examples like this one.

Example (63) perhaps illustrates deletion motivated by the adaptor's belief that the intended audience lacks certain conceptual knowledge.

(63) MILK

O. A number of . . . innovations brought about the establishment of a full-scale dairy industry . . . . Gail Borden . . . discovered a way of preserving milk. The Pasteurization process . . ., and the invention of a centrifugal cream separator . . ., of a milk bottle . . ., and of an automatic bottle filler and capper . . . all helped to make milk a big business.

The words deleted are certainly difficult vocabulary items. But we speculate that the adaptor's motivation might also have been that the readers would not know what cream has to do with milk and why it is separated. To explain this would probably take more than one extra sentence, which seems to be the adaptor's limit for added definition of a term, as illustrated in the subsection on Definitional Information below.

This brief section has considered straightforward examples of exemplars/instances of topics. We are not very surprised that this information category is adequately handled by the adaptor, for what we have termed exemplar information is the most prototypical kind of elaboration in exposition. In the next subsection, on other types of elaboration, we will have more to say about problems of adaptation and research that might be done.

Elaboration chunks. The adaptations we examined involved an overall reduction in content of from 32% to 83% of the original. Up to this point in the discussion of content changes, we have dealt with at most sentential deletion. However, larger chunks of information are often deleted, chunks that in some cases relate quite closely to the information retained and in other cases can be seen as entirely separate subsections of the original. In these latter cases, the adaptor has simply chosen not to include certain subtopics or events in the adaptation. For example, in MILK there is a section of 189 words, 12 sentences, about the different mammals that give milk. This section is completely deleted and presumably would not be missed by the reader of the adapted version; that is, the (sub)topic never comes up. There are fairly sizable chunks of this sort deleted in each of the texts under study. In DAYTON, whole episodes are deleted, not surprisingly, since the text is reduced by 83%. In TREES all specific information about the discovery of the sequoia trees is deleted. And in LIGHT the scientific explanation of the process of bioluminescence is deleted.

While the adaptor's motivation for deleting entire sections is surely to shorten the passage, the motivation for exactly which chunks to delete is somewhat harder to guess. Some chunks may be deleted due to change of focus of the entire text (as is the case in TREES). In the DAYTON text, far fewer chunks are deleted in the first part of the story than in succeeding parts. This is not surprising since the setting of the scene and the introduction of the characters are necessary for the reader to understand the remaining parts of the story. In many other cases, the decision regarding which chunks to delete seems to be primarily a matter of the adaptor's intuitive judgment.

We do not wish to dwell on these larger plot or macro-delctions. More important for our study, and more accessible for investigation by other researchers, are those chunks (possibly sentences, but more often sequences of sentences) that give additional information about subtopics retained in the adapted version.

Example (64) is a prototypical elaboration chunk which is not deleted.

(64) LIGHT

0. Also unusual, the light persists even after the animals are dead. Their dried bodies can be ground into a powder which will produce light when mixed with water. In World War II, Japanese naval officers during blackout action near an enemy moistened the powder in the palms of their hands and read their navigation charts in the dim blue light that was produced.

A. An unusual fact about Oriental water fleas is that their light keeps glowing even after they are dead. Their dried bodies can be ground into a powder. When the powder is mixed with water, it will produce light. During World War II Japanese naval officers used this powder. When they were close to the enemy during blackout night action, they moistened the powder in the palms of their hands. They could read their navigation charts in the dim blue light that it gave.

The last sentence of the original and the final three sentences of the adapted versions are classified under our scheme as elaboration. (The second sentence in the original and its corresponding material in the adaptation would be termed example information.) We gave the original LIGHT passage to six colleagues who had no connection with this research. They were instructed to adapt the material with passage length and readability formula constraints. None of our amateur adaptors deleted the elaboration. This is at least anecdotal evidence that this information may be highly salient. We hypothesize that this elaboration would be a memorable one, one that serves to reinforce the fact that light does persist after the water flea is dead. We now present some examples where such elaborations are deleted and the one example we found of addition of elaboration.

(65) LIGHT

O. On numerous occasions "balls of fire" roll away from the oars of boatmen or the feet of swimmers. These large masses of light are produced by jellyfish and comb jellies. Many kinds of jellyfish and their relatives, the corals and sea fans, can produce light, thus adding to the fascination of tropical submarine gardens.

> Several kinds of snails and clams produce light when irritated, and there are many fantastic producers of light among squids and octopuses. One deep-sea octopus is really grotesque when it turns on its lights. It has the appropriate scientific name of vampyroteuthis infernalis. Many squids, especially those that live in the dark depths of the ocean, have complex light organs located on different parts of their bodies and arms. Some contain luminescent bacteria; others secrete a luminescent mucus.

> A. Often "balls of fire" roll away from the oars of boatmen or the feet of swimmers. These large masses of light are produced by certain types of jellyfish and comb jellies. Ø Several kinds of snails and clams can also produce light when irritated. So can many snails [sic] and octopuses. One deep-sea octopus is really grotesque when it turns on its lights. Ø Many squids, especially those that live in the dark depths of the ocean, have complex light organs located on different parts of their bodies and arms. Ø

(The fourth sentence in the adaptation inexplicably has the word snails where squids is clearly meant.) In this example, three elaborations have been deleted, the first about the relatives of the jellyfish, the second about the "appropriate scientific name," and the third about the luminescent bacteria of the squids. The deletion of this elaborational information has led the adaptor to merge the two paragraphs of the original into one paragraph. Perhaps the motivation of the adaptor in choosing to delete these three sentences was that they contained "non-important" information. But what is the result of deleting this information?

First, we might note that the merged paragraph cannot be said to have any specific topic, except possibly for "sea animals that produce light," and this must be inferred. In the original, the central topic of the first paragraph is "jelly fish," while the second paragraph has an explicit topic sentence about "sea animals that produce light." But there is another difference between the second paragraph of the original and the corresponding parts of the adaptation: The elaborations on the examples in the original are deleted, leaving only a list of facts in the adapted version. For example, one of the remaining sentences is One deep-sea octopus is really grotesque when it turns on its lights. We might ask what the communicative significance of this sentence is. Without the following elaboration, about the name of this octopus, this sentence does not really make any interesting or noteworthy point; in fact, the use of one here really requires further elaboration to be felicitous. The deletion of the elaborational sentence (. . . vampyroteuthis infernalis . . .) may be motivated by the assumption that sixth-graders would not understand a "foreign" term. We feel, however, that it is still possible that they would understand the name on a humorous level.

Without the elaboration from the original, which made each fact into a subtopic in its own right, the sentences left in the adapted version do not convey any obvious point. Perhaps it would have been better to end the paragraph after so can many snails [sic] and octopuses.

In example (66) the sentence Some of them . . . is another deleted elaborational sentence!

(66) TREES

O. The Stricken Tree in the Giant Forest offers visitors a chance to see the power of lightning and the even greater power of the Sequoias. This tree was torn into hundreds of pieces. Some of them weighing a ton or more were thrown 75 feet away from the tree. And yet this tree is still alive.

A. The Stricken Tree in the Giant Forest was torn into hundreds of pieces by lightning, yet it is still alive.

The entire underlined sentence functions as a qualifier. In the adapted version, the topic sentence (. . . the power of lighting . . .) is deleted. The deletion of the elaboration may have been the result of deleting the topic sentence (the "domino effect"), or of the adaptor's feeling that the information was trivial. We feel, however, that the information renders more striking the fact that a tree so injured by lightning can still survive.

The previous two examples showed the deletion elaborational sentences. In example (67) two larger chunks of elaborational information have been deleted.

(67) TREES

O. No other tree can put up such a terrific fight for life. When a big tree falls its needle-like leaves do not wither for years. "I saw one giant crash in 1926 when I was near," related John R. White, the former superintendent of the park. "I saw it again in 1931. Its leaves were still fresh and green."

It is almost impossible to destory a Sequoia. The wood never seems to decay or become rotten. Trees which fell centuries ago could still be cut into lumber. There are hundreds of old snags and stumps in the Giant Forest which may be ten or twenty thousand years old. Yet beneath the fire blackened outside, the wood is still sound.

A. No other tree can put up such a terrific fight for life. When a big tree falls, it takes years for its needlelike leaves to wither. Ø The wood never seems to decay or become rotten. Ø

The elaborations do take up a considerable amount of space and the adapted paragraph with the deletions is perfectly coherent. However, a relevant question is whether there is a trade-off between elaboration (which reinforces the topics) and brevity (which decreases reading time). In the case discussed here, a better balance might be achieved by the inclusion of some of the elaborative information, e.g., Trees which fell centuries ago could still be cut into lumber. This would give somewhat more prominence to the example sentence, The wood never seems to decay.

Our final example of the deletion of an elaboration is (68):

(68) TREES

O. The soft reddish bark is from two inches to two feet thick. It is almost as fireproof as asbestos and it also resists attack by insects. Next to the bark, on the inside, is the layer of wood through which flows the life-giving sap of the tree. This layer is called the sapwood.

> There is one tree in the Giant Forest called the Black Chamber. The whole inside has been eaten out by fire. Only about one thirtieth of the bark remains beneath which the sap can flow. Yet each year this tree sends out new shoots.
>
> A. If given a chance before another fire comes, the tree will heal its own wounds. It will grow new bark over the burned part. One tree in the Giant Forest, the Black Chamber, has had its whole inside eaten out by fire. Ø Yet each year this tree sends out new shoots.

The entire paragraph about the fire resistance of the bark and the sap is deleted. Since this paragraph is deleted, the sentence about one thirtieth of the bark remaining is deleted from the discussion of the Black Chamber in the adaptation, an example of the "domino effect."

When the sentence about the remaining bark is deleted, the reader is given no explanation (basis information) for the fact that the tree is able to send out new shoots. However, if this sentence had been retained, its import would have been unclear without an understanding of the protective function of the bark and the flow of the sap, as described in the previous (deleted) elaboration. Hence, deletion of elaborative material may lead to other deletions that are more serious in their consequences.

Example (69) is the only example we found of an added elaboration.

(69) MILK

> O. A number of nineteenth century innovations brought about the establishment of a full-scale, factory type dairy industry in this country. . . . pasteurization process . . . invention of centrifugal cream separator . . . an automatic bottle filler and capper . . . all helped to make milk a big business. Ø

A. But in time new inventions made the dairy industry big business. The pasteurization process . . . . a special milk bottle was designed . . . . the invention of machines that could fill bottles and cap them automatically.

These discoveries had a great effect on the dairy industry. They meant that milk could be stored longer. It could be safely shipped over long distances. Preparing and distributing milk soon became a large-scale business.

The addition of this paragraph explains in detail the significance of the inventions, i.e., that milk could be stored longer and shipped over longer distances. The information added by the adaptor is not taken from any part of the original text. The adaptor's motivation was, we guess, to clarify the claim about the growth of the milk industry. As this is the only addition of this type of information that we found in the four texts under study, it is impossible to make any generalizations about additions of elaboration, or to distinguish them from extensive summary interpretation (see Organizational Information above).

Qualification information. Here we discuss verbal and nominal qualifiers; e.g., adjectives, relative clauses, and adverbial phrases. The information conveyed by these qualifiers is in a descriptive relationship to that element which they qualify. This category of information is the subsentential analogue of elaboration chunks.

In general, the function of these qualifiers is to give a more complete picture of what is under discussion. What is of interest to researchers is the contribution that any particular qualifier makes or might make to the conceptualization of the information presented in the text.

The deletion of a particular descriptive phrase used might make for a less salient picture of what is being described, as in (70)

(70) TREES

O. A fallen tree may also be hollowed out by fire. Then it becomes a "tunnel" through which people may walk or even ride horseback.

A. Sometimes a fallen tree has been hollowed out by fire. Then it becomes a tunnel through which visitors can walk 0.

where part of the relative clause descriptor, or even ride on horseback, has been deleted. Even if a particular child did not have real-world experiences with horses, he should realize that a rider on a horse would reach a height greater than a person standing up. Further, the word even implies that there is something special about being able to ride horseback through a tree trunk, i.e., that the trunk must be exceptionally large. This qualification is not unimportant. In fact, it is, we hypothesize, quite striking and memorable. The four words through which this information is given will contribute slightly to raising the grade level of the passage on many readability formulas which might be used but there are considerations other than readability formula scores. Researchers should investigate the trade-offs between shorter sentences which take less time to read and are perhaps easier for the reader to process, and longer sentences which, even if they require more effort, contain content which is relevant, interesting, and memorable.

Bruce and Newman (1978) and Bruce (1978) argue that children who have experience only with stories in which characters do not interact to any great degree have difficulties understanding more complex plots, for they will not have learned the skills to understand and further may not even learn that there is a point to reading. A similar point needs to be made for expository material; the "complexities" that might be created by the inclusion of qualification information may be more than offset by the reader's gain of information with which he/she can visualize relationships. The color and interest of these details might give the reader the idea that reading is worthwhile.

Another interesting example is (71):

(71) MILK

O. In Toronto, a suburban ice-skating rink was flooded with 250 surplus gallons of it (= skim milk).

A. An ice skating rink was flooded with Ø it (= skim milk).

Here the notion that the milk is surplus is deleted. This qualification provides the reader with the motivation for using the skim milk on the ice-skating rink. Without this information, the reader might infer that skim milk is useless or that the people who flooded the rink with the milk were wasteful. We suspect that the motivation for the deletion of the qualifier was that the word surplus was a difficult vocabulary item for the intended audience. This problem could have been remedied in ways other than deletion, one possibility being a relative clause like milk that would have spoiled.

In contrast to examples (70) and (71), where we judge the qualification to have a good deal of importance, the next eight examples are presented to give an idea of what we consider to be fairly well-motivated deletions of qualifications. These examples also illustrate the variety of syntactic constructions in which qualification information can appear.

(72) TREES (Quantity information)

O. It blooms during the winter, when the ground is covered with 4 to 20 feet of snow.

A. It blooms during winter, when the ground is covered with Ø snow.

(73) TREES (Temporal information)

O. As early as 1878 he called attention to the need of saving the forests.

A. He wrote about the need for saving the forests . . .

(74) TREES (Location information--relative clause)

O. They are the world-famous Big Trees, the Giant Sequoias which grow only in the Sierra Nevada of the Golden State.

A. They are the famous "big trees," the giant sequoias.

(75) MILK (Location information--prepositional phrase)

O. . . . the first pictorial description of milking is found on a frieze dug up by archaeologists at Tel-El-Obeid, near the ancient city of Ur . . .

A. A picture of milking has been found in the ruins of an ancient city.

(76) LIGHT (Descriptive adjective)

O. . . . many have lights at the tips of modified fins.

A. Others have lights at the tips of their fins.

(77) TREES (Descriptive adjective)

O. It contains Big Trees in every stage of growth, from tiny seedlings to tremendous sky-piercing giants.

A. The largest, the Giant Forest, contains the big trees in every stage of growth, from tiny seedlings to sky-piercing giants.

(78) MILK (Agent by-phrase)

O. The Pasteurization process in 1856, and the invention of a centrifugal cream seaprator in 1878, of a milk bottle--by Dr. Harvey D. Thatcher--in 1884, and . . . all helped to make milk big business.

A. Next, a special milk bottle was designed.

(79) DAYTON (Manner phrase)

O. "Cheer up, Kid!" he called, waving his hand.

A. "Cheer up!" he called.

There are a number of possible motivations for the deletion of this kind of information. In (74) and (77) we speculate that the information is considered redundant; for (75) the world knowledge required to understand the notion of "modified" fins is likely lacking; and for all of these examples, the information might well be deemed irrelevant or unimportant.

We found in our study one significant example of the addition of qualification information. This is the word special in example (78) above, which the adaptor has added to make the milk bottle salient as an invention. While an adult reader might well infer from the original text that in the 1800's people used random containers to store milk, and so the invention was in fact the invention of a bottle for milk, the younger reader is not likely to produce such self-elaboration (see Reder, 1978). Thus, the addition of the adjective special adds significance to a sentence which would otherwise seem trivial or pointless.

Clearly there is qualification information that is trivial and qualification information that is important for interpretation of the text or for the more esthetic purpose of making reading an enjoyable enterprise. What is needed for further research is a characterization of the sub-types of such information and experimental evidence of the effects of their presence or absence on the interpretation of a text. Further, more general research ought to be conducted on whether children and adults differ on perceptions of what is interesting, dull, vivid, etc. What seems trivial to the adult adaptor might be intriguing to the young reader, and something that is thoroughly engrossing to the adult might be lost on a younger reader.

These final [illegible], while specifically directed to the findings of this subsection, clearly extend to the other subsections above. Our criticisms of deletions of basis information, organizational information, elaborations, qualifications, and in a later subsection thematic information, rely heavily on our perceptions of younger readers.

Connectives

By connectives we mean those lexical items indicating relationships between sentences and clauses, e.g., and, or, but, then, also, therefore, etc. Discussion of the many types of connectives may be found in Halliday and Hasan (1976), van Dijk (1977), and most any grammar of any language.

Our hypothesis is that if connectives are deleted, the reader must infer a connection between sentences. If connectives are added, the relationships is presumably made more explicit for the reader. Here we will deal in the main with simple deletion of connective information, not necessarily in association with sentence splitting. (See also Sentence Splitting and following sections above.)

We found in our sample a number of deletions and additions. First we give some examples of deletions:

(80) TREES

O. This tree's 72 foot height matches that of a 27-story skyscraper. . . . . It contains enough lumber to build a good-sized village. _Or_ if the General Sherman Tree were sawed into one inch boards, it would make a box large enough to hold the greatest ocean liner ever built.

A. This tree is as tall as a twenty-seven-story skyscraper. It contains enough lumber to build a good-sized village. It would make a box large enough to hold the greatest ocean liner ever built.

(81) DAYTON

O. The whole street was full of water--nasty yellow water. _And_ men were walking around in it, almost up to the tops of their high rubber boots.

A. The whole street was full of water. Men were walking around in it. It came almost up to the tops of their high rubber boots.

In (80) the coordinate _or_ has been deleted. This would not seem to be a problem, as all the sentences in this paragraph are hypothetical examples included to give an idea of the size of the General Sherman tree. If this is understood, the individual examples would be interpreted disjunctively, thus making or unnecessary. But it would also be possible for the reader to infer an unmarked 'and' relation here, thus interpreting the amount of lumber to be enough to build a village and an ocean liner box.

In (81), the deletion of sentence-initial and changes the tone of the description slightly, making the passage somewhat less narrative (see Additional Stylistic Changes below). Perhaps the motive of the adaptors for the deletions in both (80) and (81) was to satisfy a prescriptive rule against starting sentences with such coordinating conjunctions.

Example (82) is more complicated:

(82) DAYTON

O. About four o'clock it began to rain again--to pour. And every time one of those big drops hit the water it made a bubble as big as an egg.

We had water to drink after that. We set out basins and caught the rain drops. But then suddenly it began to get dark. It had been awful enough before that, but we had taken it good-naturedly and laughed and joked. But now we all began to feel kind of creepy.

A. About four o'clock it began to rain again--to pour. We set out basins to catch the raindrops so that we would have water to drink. Soon it began to get dark, and we all began to feel creepy.

Along with the deletion of the sentences about the big drops hitting and the background statement about how the people had felt previously, the adversative conjunction but is deleted. There is some loss of indication of transition here. But is conventionally associated with "not in accordance with expectation," and its deletion entails the loss of some dramatic effect.

There are also additions of connectives made by the adaptors, some probably motivated by concerns of clarification, others most certainly as consequences of structural changes made by the adaptor. Two examples follow. The connective still, added in example (83),

(83) MILK

O. Among the Greeks, milk was a symbol of regeneration and was also used for medicinal purposes . . . . Hippocrates . . . . Romans . . . Nero's wife . . . .

Milk gradually became celebrated in Europe for its supposed medicinal qualities . . . .

A. Many ancient people also thought that milk had great healing power . . . . Greek doctor . . . . Romans . . . . wife of one emperor of Rome . . . .

In the Middle Ages in Europe, milk was still popular as a medicine.

reflects a continuation of the topic of "milk and medicinal applications." In the original, the material is all under a subheading MEDICINAL in boldface print. The adaptation does not employ subheadings, and so the addition of the explicit connective still indicates continuation of the topic. The connection is also present in the original version, Milk gradually became celebrated in Europe for its supposed medicinal qualities . . ., but the adaptor has made the connection explicit in his use of still.

The second addition of the connective we discuss is the also in (84):

(84) LIGHT

O. On numerous occasions "balls of fire" roll away from the oars of boatmen or the feet of swimmers. These large masses of light are produced by jellyfish and comb jellys. Many kinds of jellyfish and their relatives, the corals and sea fans, can produce light, thus adding to the fascination of tropical submarine gardens.

Several kinds of snails and clams produce light when irritated, and there are many fantastic producers of light among squids and octopuses.

A. Often "balls of fire" roll away from the cars of boatmen or the feet of swimmers. These large masses of light are produced by certain types of jellyfish and comb jellies. Several kinds of snails and clams can also produce light when irritated . . . .

Here, it should be noted, two paragraphs in the original are "merged" into one. In the original there is no overt connection between the two paragraphs. The addition of also makes the connection between the implied irritation of the jellyfish and the irritation of snails and clams. This connective is used as a kind of "topic-channeling device" as described above.

Referential Connection

In this brief section we will discuss some alterations in the way reference is made. Although we found that connectives were usually deleted, requiring that more inferences be drawn, we find only addition of referential information, which, we would predict, makes the connection between sentences in a text more explicit. For example, in (85):

(85) TREES

O. "How long can a Big Tree live?" is a question often asked by visitors. The age limit is unknown. Since some 0 have already neared or reached 4000 years, it seems reasonably certain that they can live 5000 or 6000 years.

A. How long can a big tree live? The age limit is unknown. Since some of the trees have already neared or reached four thousand years, it seem reasonably certain that they can live five or six thousand years.

we see the addition of the phrase of the trees. It is possible that a reader who is not integrating the incoming information adequately might reach the word some and fail to connect it with a noun-phrase previously encountered. Given however that this entire text is about the sequoia trees, we rather doubt that the presence or absence of this referential phrase will ultimately affect comprehension though it might affect speed of comprehension. In any event, the adaptor clearly has seen this as a potential problem and so has made the referential connection more explicit.

Explicitness of reference is required, however, if what is referred to is not easily recoverable. Thus, if a subdiscourse had intervened between the second and third sentences, as in (86), explicitness of connection would be necessary, for example:

(86) TREES

How long can a big tree live? The age limit is unknown. Scientists studying the question have made many speculations, and some scientists have even tried to model life cycles by computer. None has had much success. But even without computer models we can make a good guess. Since some have already neared or reached four thousand years, it seems reasonably certain . . . .

The incidental comments about what scientists have done has brought in a new scene, and for the discourse to be comprehensible, the more explicit referential phrase some of the trees would be needed to bring the concept of the sequoia trees back into focus for the reader.

We can perhaps see the addition of referential connection performing a recovering function in example (87):

(87) MILK

O. The cord fabric of auto tires is coated with casein to keep them from overheating.

A. The cord fabric of auto tires is also coated with casein. This helps to keep the tires from overheating.

Here the original sentence is spilt into two sentences and the pronoun is replaced by a full noun phrase These sentences are in the middle of a paragraph, and appear in a list of example sentences, each of which describes one use of casein. The sentence in question is split into two sentences unlike the others in the paragraph. We hypothesize that the addition of the more explicit referential phrase might aid the reader in connecting the second sentence of the adapted version locally to the preceding sentence, thus breaking the parallelism of one example of the uses of casein per sentence of the previous three sentences in the discourse.

A major question psycholinguistic research must answer is whether there are stages of acquisition of types of surface referential connection in context. If this question can be answered, then we will have a measure of the actual readability value of referential connection, and texts can be constructed that are neither too obscure in reference nor too redundant for readers of differing abilities.

Thematic Information Deletion

The next type of change we will concern ourselves with in this section is that of general pervasive thematic material, which is independent of the specific topic of a text. It includes such things as scientific versus nontechnical orientation, taboo bodily functions, strong emotions, and gruesome details. Thematic material can intersect and interact with topics and themes in a given text, and, with regard to its communicative function and syntactic form, can belong to various of the categories discussed above. We have found only deletions of thematic material in the texts under study.

LIGHT provides us with numerous examples of deletion of thematic material. In general, the scientific orientation of the original text has been excised in the adaptation: Deleted, for example, are earlier, discredited scientific explanations of bioluminescence, the exact chemical processes involved in it, and especially the biological process of reproduction. Below are illustrations, representing the various ways that thematic information can be expressed.

First, let us look at a qualifier which carries some thematic information:

(88)

O. Some of the several hundred species have complex lenses . . .

A. Some have complex lenses . . .

In the adaptor's apparent attempt to minimize the scientific orientation of the adaptation, he has deleted a detail which conveys the biological diversity of the creatures being discussed.

Topical information is deleted in (89), as it refers to the biological process of reproduction:

(89) LIGHT

O. These animals swarm during their reproductive period, and often their activities seem to be regulated by certain phases of the moon.

A. These are tiny sea worms that swarm only at certain times of the year.

The topic of the original paragraph, and the following seven paragraphs, is the connection between reproductive swarming activities and phases of the moon. In the adaptation, the topic is the swarming of the worms at certain times, with the motivation of reproduction deleted.

In the following examples all references to taboo bodily functions and things which suggest them have been deleted.

(90) DAYTON

O. The whole street was full of running water--nasty yellow water.

Nasty yellow water (with connotations of "urine" or sewage) suggests a taboo topic.

(91) LIGHT

O. And they are also "come hither" signals to the opposite sex.

This sentence occurs in a paragraph giving examples of how fish use bioluminescence. While the other two examples in the original paragraph are preserved in the adaptation, this one is completely removed.

In DAYTON, there is a general theme involving fear and horror. However, many events and details which involve gruesome descriptions or mention death are deleted. For example:

(92) DAYTON

O. And after that came horses from the livery stable. . . . . They whinnied and made a queer noise, a sort of half cry and half snort--an awful sound that went right through you. And their lips were all curled away up over their noses, with all their teeth showing.

"They are all in when they do that." said Mr. Collopy.

A. After that came horses from the stables. . . . . They made a queer noise--half cry and half snort. The awful sound went right through me.

The deleted sentences elaborate on the event, giving a horrifying picture of the horses drowning. In the adaptation, it is not mentioned explicitly that they drown, although this could be inferred from what remains; but the most unpleasant information and description are left out.

Also in DAYTON, all of the numerous references to food are deleted, even though they do not seem at first glance to portray anything horrible. However, they foreshadow another very unpleasant episode in the characters' plight--severe hunger. Many other events in the story which are deleted entirely in the adaptation also portray gruesome pictures, which could be a motivation for their exclusion.

Definitional Information

This category refers to information that defines terms or expressions. If a reader does not know what a term means or cannot figure it out from context, the point of the sentence in which such a term occurs is not likely to be understood. It is not surprising, then, that in adaptations information should be added where the adaptor considers it probable that the reader will not know a particular term.

We present some representative examples of the addition of definitional information and of the one example we found of deletion of such information.

(93) MILK

O. . . . and there are some fifty references to milk . . .
in the Bible, including the famous description of Canaan
as a land "flowing with milk and honey."

A. . . . of Canaan as a land "flowing with milk and honey."
"Flowing with milk and honey" is an expression that means
"rich in things to eat."

(94) MILK

O. The Pasteurization process in 1856, the invention of . . ., and . . . all helped make milk a big business.

A. . . . Louis Pasteur introduced the pasteurization process. This process killed the bacteria in milk that caused it to spoil.

(95) MILK

O. . . . soft curd milk, in which the curd is softened to aid digestion by boiling or other methods.

A. There is soft curd milk, in which the curd, or solid part, is softened to make it easier to digest.

(96) LIGHT

O. Other insects, such as the cucujos and lantern flies of tropical forests, produce a very intense light.

A. Other insects, such as the cucujo beetle and the lantern fly found in tropical forests, produce a very intense light.

(97) LIGHT

O. Waves from the launch roll under the mangroves that fringe the lagoon . . .

A. Waves from the launch roll under the mangrove trees that border the lagoon.

(98) MILK

O. In this country, milk has been flowing since 1611 when the first cows were brought to the Jamestown colony. The Plymouth colony got its cows in 1624.

A. Both of the earliest American colonies, at Jamestown and at Plymouth, had small dairy herds.

Examples (93-97) all illustrate the addition of information defining or explaining a term that may not be known to the reader (at least in the adaptor's opinion). We note that the examples in (93) and (94) are sentential, that (95) is an appositive phrase, and (96) and (97) are lexical changes. Example (98) does not really define a term, but the addition of information that Jamestown and Plymouth were the earliest American colonies does add encyclopedic information that might be more informative to the reader than the dates 1611 and 1624 given in the original. The explicit added information that these colonies were the earliest may make the statement more obviously significant.

We found only one example of deletion of information defining a term, i.e.,

(99) MILK

O. . . ., fortified milks, with Vitamin D or other nutrients added; concentrated milks, condensed, evaporated, frozed, or dried.

A. Milk also comes fortified, concentrated, condensed, evaporated, frozen, or dried.

There are no contextual clues in the adapted version to the meaning of fortified. The defining phrase may have been deleted for several reasons: because the reader could be expected to know the term, or because the adaptor viewed the contents of a non-restrictive phrase as less essential information, and/or saw an opportunity to shorten a sentence.

Lexical Change

The most basic technique available to the adaptor is lexical change. It can be readily accomplished by the adaptor on the first sweep through a text without the added complication of making major changes in the structure of the text.

The choice of the words to be removed from the text and of their replacements requires decisions based on certain principles . One can think of various ways in which these decisions can be made. The lay person may think it all a matter of the adaptor's linguistic intuition. This would not be a bad guess, considering that a person without any special training in the adaptation of texts can intuitively point out the difference in the complexity between nourishment and food, for instance, or between agitated and stirred up.

Although it is evident that such intuitions can play some role in lexical simplification and can be useful, they do not, for the most part, fully account for the change. In addition to intuitions, the adaptor has at hand a number of materials which can aid the choices and decisions of the simplification process. These are such resources as vocabulary lists and readability formulas, which can serve as objective standards for the adaptor when adapting a text and simplifying its vocabulary.

Word Lists and Readability Formulas

Sight-vocabulary lists and word-frequency lists like the Dale list of 3000 familiar words (cf. Dale & Chall, 1948), Thorndike and Lorge's Teacher's Word Book of 30,000 Words (1944), and Carroll, Davies, and Richman's Word Frequency Book (1971) are all vocabulary manuals which are or can be used as a part of readability formulas, by both writers and educators, to determine the reading level of the texts they create.

The difference between these lists lies in the manner in which they were compiled. Words found in the Dale list were selected by questioning a sample of fourth graders who checked the words they knew. A word was included on the list when 80% of the sample had sight knowledge of the words. The other lists, on the other hand, were compiled on the basis of the number of times a lexical item appeared in a cross-genre sample of selected texts.

In simplifying a text, the two types of lists will be used differently. Using the Dale list, an adaptor may replace an item not on the list with one that is. For example, this could have been a motivation for the change of produce to make in LIGHT, since make appears on the Dale list while produce does not. An adaptor will change the vocabulary differently when using a list based on word frequency. Using this type of list, the adaptor will check the frequency of a word thought to be difficult or less comprehensible at the reading level to which the text is being adapted. If a word is of low frequency, i.e., it is not found too often in the sample of selected texts, and consequently, would be less likely to be comprehensible to the child, the adaptor would probably replace it with a word having a higher frequency. This would make it more likely for the child to have encountered it in previous readings. In LIGHT, (capable) of luminescence is changed to (able to) produce light. This is a possible case of the use of frequency lists by the adaptor because produce and light have markedly higher frequency than luminescence. Interestingly, produce is changed to make, in one case, while in another, produce light replaces luminescence. It seems that in one case, the unfamiliarity of the original word caused produce light to be used as a replacement, while in the other case, frequency seems to have been the criterion for replacing produce with make. This shows the possible overlapping of the two types of lists and the possible discrepancies resulting from their simultaneous use.

In addition to word lists, the adaptor can also use readability formulas to aid in lowering and simplifying the reading level of a text. These formulas are, in general, based on certain countable variables, principally the number of words and syllables in a sentence. Formulas like Fry (1972) and Dale and Chall (1948), for example, depend on such variables.

Whenever these readability formulas are used in adaptation, sentence length and syllable number may dictate some of the lexical substitutions an adaptor might make. The adaptor works to fit the adaptation to a certain level by measuring and checking the changes at various points until the desired level is reached. A polysyllabic lexical item might be replaced by a monosyllabic one, or a short expression might be exchanged for a longer expression, just to obtain the proper reading level correlations by decreasing syllable count and sentence length. The change of the most studied and written about to the best known in LIGHT may have been motivated by considerations of this sort. The original is neither more difficulty, more idiomatic, nor more ambiguous than the replacement. Nor is it even better suited to the text. The reason for this exchange, then, might simply be a matter of adherence to restriction of space and length.

The validity of these formulas has recently been questioned by Charrow (Note 2) and Freeman (Note 1). The formulas may be misleading since the numerical values these formulas yield say nothing about potentially important textual properties such as content, semantic appropriateness of one lexical item rather than another, etc. That is to say, if these materials are used without any consideration of just what is being conveyed, they may cause more problems than they solve.

In some cases, long words or phrases are replaced by shorter ones not only because of considerations of length, but also because longer lexical items tend to be less frequent and less familiar to the young reader. In LIGHT, for example, on numerous occasions was probably changed to often for reasons of both length and word frequency, and this . . . is correctly referred to as was no doubt changed to this is called for similar reasons. As several factors may motivate a single change, we may wonder whether there is a hierarchy which ranks these considerations in order of importance. It seems that frequency is a stronger motivation for change than is length, as we found a number of examples that were simplified and lengthened.

In fact, some clarification by paraphrasing may even necessitate the creation of an entirely independent sentence. For example, in (100), _condensing_ is replaced by _take some of the water out_, while an entirely new sentence was formed to express the notion of preserving:

(100) MILK

O. In 1851, Gail Borden . . . discovered a way of preserving milk by condensing it.

A. In 1851, Gail Borden . . . found a way to take some of the water out of milk. This made it keep much longer.

The fact that a new, short sentence has been created would not necessarily affect scores or readability formulas which are based on average number of words or syllables per sentence. The total length of the passage is increased, however.

Lexical Exchange

Change of lexical items usually involves the replacement of a difficult lexical item by a lexical item considered to be more readily comprehensible at the level to which the text is being adapted. In its most general form, lexical change is simply the one-for-one exchange of lexical items, without any change in the syntactic class or syntactic function, and without any drastic change in the semantics; also, the sentence retains its structure. For example, the verb _agitate_, found in example (101), is replaced by the verb, _stir up_. Both _agitate_ and _stir up_ are verbs, used in the same way, i.e., the same tense, etc., and have basically the same meaning in this context.

(101) LIGHT

O. Myriad small fish and shrimp, darting away from the boat, *agitate* the tiny light-producing organisms so numerous in this lagoon.

A. Hundreds of thousands of small fish and shrimp, darting away from the boat, *stir up* the tiny light-producing organisms.

Such one-for-one replacement was typical of the texts examined. In MILK, for example, the lexical item *nourishment* was replaced by *food*. Similarly, *nerve* in DAYTON was changed to *courage*, and in TREES *needed* was substituted for *required*.

A resulting change in the level of reading, as exemplified above, can be termed *lexical simplification*, a pervasive device in adaptation, as can be seen from the following sample:

(102) TREES

O.	A.
regarded as	thought to be
required	needed
produce	give way

(103) MILK

O.	A.
nourishment	food
celebrated	popular
prehistoric	before history
continue	keep on
condensing	taking the water out
disperse	mix

(104) LIGHT

O.	referred to	A.	called
	produce		make
	emerges		comes out
	unique		unusual
	fringe		border
	abundant		numerous
	persists		keeps

(105) DAYTON

O.	come down again	A.	hit
	nerve		courage

In addition to vocabulary list considerations, we can distinguish four other reasons why lexical items are replaced by simpler counterparts. A lexical item may be replaced (1) if it is a specialized or technical term, (2) if it is too idiomatic, (3) if it is vague or ambiguous, and (4) if it is obsolete or has fallen from current usage.

Specialized and technical vocabulary. In the case of technical words, it is often necessary to convey what the words mean in more familiar terms. The choice depends on the importance of these technical terms within the text. If they are crucial to the development of the text, like *bioluminescence* in LIGHT, then they may be retained and clarified with a paraphrase or even a definition, as in example (106):

(106) LIGHT

A. The production of light by living organisms is called *bioluminescence*.

If, on the other hand, the terms are of minimal importance to the content of the text, they may simply be replaced. In LIGHT, for example, (*capable of*) *luminescence* is replaced by (*able to*) *produce light*. Although bioluminescence is the main topic in both versions of LIGHT, the adaptor chose to replace the term *luminescence*. The reasoning behind this change might be that the topic of bioluminescence and the meaning of the word *bioluminescence* had been established and clarified by a definition in the adaptation. As a result, the word *luminescence* is no longer crucial to the development of the text and may be simplified without any reservations. In MILK, *insecticides* is changed to *insect poisons*. Rather than clarify or explain the specialized term *insecticides*, the adaptor chose to replace it with a corresponding simpler term which can be more easily interpreted without special knowledge. Since *insecticides* has no bearing on the main topic of exposition and is textually relatively unimportant, this change is probably well motivated.

The simplification of technical lexical items was typical of only MILK and LIGHT; no examples were found in either TREES or DAYTON. We believe that this has to do with the genre of prose each text represents. Both MILK and LIGHT are semi-scientific expositions while, in contrast, DAYTON is a narrative and TREES is a mixture of narrative and descriptive prose. Our assumption is that expository prose, because of its explanatory function, s a greater tendency to contain certain technical vocabulary.

The treatment of proper nouns is curiously similar to changes in technical vocabulary. Lexical exchange by paraphrasing usually occurs when the reference is considered to be out of the young reader's range of knowledge. Sometimes a lexical item is completely replaced by a paraphrase that is less specific in its reference, but retains the gist of its meaning, as in produce light for luminescence. Typically, these lexical items are names and places. Rather than require the reader to spend time working out the reference of an unfamiliar lexical item, the adaptor can replace it with a paraphrase the reader will immediately understand. For example, Hippocrates in MILK is replaced by the phrase, one of the most famous Greek doctors. This is done to convey to a young reader the information which an adult reader would probably already know as background information associated with the name Hippocrates. The name alone would not provide sufficient information for a child. The point of mentioning Hippocrates in MILK is his status as a medical authority, since at this point in the text the medicinal value of milk is being expounded upon. If Hippocrates were not explained, the reason for mentioning him would not be clear.

Similarly in MILK, Nero's wife Poppea is replaced by the wife of one emperor of Rome. This paraphrase is not as striking as the one above, since it only serves to clarify and not to quote an authority. Poppea is just identified as the wife of one of the emperors of Rome. The paraphrase does not add any other information that would justify the assertion about the cosmetic value of milk, which is the topic under discussion. Difficult place names are paraphrased as well, such as Tel-el-Obeid near the ancient city of Ur, which becomes an ancient city in MILK.

Idioms. Words and expressions used idiomatically sometimes require simplification, even if the component parts are frequent or familiar words.

When the adaptor comes across an item which seems to be idiomatic, he/she must decide wether or not it merits replacement. If it is transparent in meaning, either because it is very common or because the item is readily interpretable by some principle of compositionality (i.e., the sum of the meaning of the parts equals the meaning of the whole), it is reasonable for the adaptor to retain the item. If its meaning is opaque or uncommon, the adaptor is justified in replacing it by a lexical item that has a more transparent meaning.

A good example of this is found in MILK. In the adaptation, the idiomatic expression, have on tap in the original version (had 500 beasts on tap . . .) was changed to the simple lexical item kept. Since the meaning of keep is more transparent than the meaning of the fixed expression have on tap, the change is probably justified. Even though have, on, and tap are probably all on lists of frequent and familiar vocabulary, they are not used together with their primary meanings in this context. Other cases may not be quite so clear-cut. Still, the adaptor may choose to play it safe and replace the terms in question by a more straightforward expression.

Another example is the change of went on to kept on as seen in example (107):

(107) DAYTON

O. And we went on looking out the window.

A. We kept on looking out the window.

This is a case of change motivated not by problems of idioms *per se*. Although *go on*, like *keep on*, means "to continue," an adaptor taking the prescriptive point of view may not consider it as stylistically appropriate.

Vague and ambiguous vocabulary. In adapting a text, the number of meanings a lexical item can have may determine whether or not it requires simplification. Lexical items often have more than one meaning. While it is usually the case that contexts narrow down the possible meanings, some words may remain ambiguous, necessitating a change to an unambiguous expression in that context. In the adaptation of DAYTON, for instance, the substitution of *funniest* by *strangest* is probably motivated by such considerations. This is seen in example (108):

(108) DAYTON

O. But the *funniest* thing was the rats. They came sailing down on soap-boxes and things--sitting up just like squirrels, looking around for a place to jump off.

A. The *strangest* thing was the rats. They came sailing down on soapboxes, sitting up just like squirrels.

While *funniest* may either mean "humorous" or "queer," *strangest* only means "queer." Rather than allow more than one interpretation in a context, the adaptor chose to change *funniest*, thereby guaranteeing only one possible interpretation in that context. In example (109) the reference to the railroad freight agent is deleted and, as a result, the meaning of *flat* in the context of *cars* becomes ambiguous. As the child may visualize *flat cars* as a series of crunched automobiles rather than the freight car of a train, as intended, the phrase is changed:

(109) TREES

O. A railroad freight agent has figured that it would require at least 40 modern flat cars to haul just the trunk.

A. And at least forty freight cars would be needed to haul away just its trunk.

Freight car is limited in meaning to trains and thus the adapted version is unambiguous.

In some cases, ambiguous or vague references may be clarified by adding modifiers or paraphrasing the original item. Often, these take the form of adjectival or prepositional phrases, if the terms in question are nouns, as in example (110):

(110) DAYTON

O. They came down one after another, and the water took them and whirled them round and round like chips.

A. The water took them and whirled them around like chips of wood.

This addition eliminates the vagueness of the lexical item chips, whose interpretation would not have been clear from the context.

Sometimes, unfamiliar terms, especially those of a scientific or technical nature, may be clarified by the addition of a more general term, as in example (111):

(111) LIGHT

O. Other insects, such as the cucujos and latern flies of tropical forests, produce a very intense light.

A. Other insects, such as the cucujo beetle and the lantern fly found in tropical forests, produce a very intense light.

Since cucujos are beetles rather than flies, the adaptor chose to specify cucujo by adding the generic name, thereby ruling out the wrong interpretation.

Similarly, in the following passage, the adaptor added trees in order to clarify what mangroves are, since the name is unlikely to be familiar to the reader. It would only have been possible to infer from the words roots that they were some kind of vegetation:

(112) LIGHT

O. Waves from the launch roll under the mangroves that fringe the lagoon, and there they break on the roots producing a weird and ghastly light.

A. Waves from the launch rolled under the mangrove trees that border the lagoon. They break on the roots, and make a weird and ghastly light.

Obsolete vocabulary. Obsolute and non-current vocabulary are possible causes for comprehension difficulties and are simplified by replacing them with current terms. It is reasonable to assume that obsolete and non-current lexical items are most likely not within the child's range of knowledge.

The DAYTON adaptation, which was written in the 1960's, offers some examples, since the original was written much earlier, in 1913. We see examples of obsolete lexical items and lexical items which have lost a particular sense. In the adaptation, the lexical item contract was replaced by building project. This exchange is motivated by the fact that the "building project" meaning of contract is obsolete. In the same adaptation, kettles was changed to pans, in this case, because kettle now has a more restricted meaning.

"Thematic" Change

Some changes seem to have been motivated by more global considerations, such as a change in the focus of the text as a whole or the deletion of a particular theme or even the adaptor's own point of view on the subject. As a consequence of these changes, some lexical items from the original version may no longer be suitable to the adapted text.

A change in the focus of a text may subsequently cause lexical changes. The original topic of TREES, for instance, was the Sequoia National Park. Hence visitors to the park were often referred to. In the adapted text, on the other hand, the focus is on the special properties of the Sequoias, so that reference to visitors is for the most part absent, as the result of deletions of those passages which deal mainly with them. Most references are simply to people, with one occurrence alone of the word visitors.

Certainly, some social considerations may lead to wholesale deletions of reference to taboo subjects such as sex and reproduction and bodily functions (cf. Content section above). In some instances, however, the potentially offensive term is simply replaced by a "safer" one. The change from mucus to substance found in the LIGHT texts is a good example of this. The adaptor, presumably under certain social pressures, makes the vocabulary in the text suitable for children by replacing such expressions with words that are neutral in their connotations. Since the materials are designed to be used widely and since social attitudes towards specific words may vary, it is likely that the adaptor has decided to be rather conservative and has chosen terms which are less likely to be found objectionable.

Other changes seem to involve a personal preference of the adaptor, and imposition of the adaptor's writing style or point of view. For example, this may involve a desire to make a text more emotive or colorful, as seems to be the case in DAYTON, where a number of "verbs of saying" are changed to more exclamatory verbs, as in example (113):

(113) DAYTON

O. "Oh, Jack," I said, "come here."

A. "Oh, Jack," I cried. "Come here!"

In this case, the emotional content is shifted from the direct quote to the main verb. As will be noted later (in Emotionally loaded words), deletions often remove material which describes emotions, especially in DAYTON, so that the change described here might be seen as a partial compensation for these deletions.

While many cases of lexical change result in an adapted text which is probably easier to read than the original, not all changes are equally felicitous. For example, in LIGHT, capable of bioluminescence is changed to are able to produce bioluminescence. Since bioluminescence is the production of light, the change from capable of to produce results in a redundant phrase, clearly not the best choice.

Complex Changes

In some instances, no simple substitution of one word for another is possible. Rather, changing one word may necessitate a more general restructuring of the sentence in question. Sometimes the change may not be from one noun to another, for example, but from a noun to a different part of speech, which in turn will require additional changes to be made.

Changes in syntactic category. An example of a change of syntactic category but not of function is found in MILK. The adjective milkable is replaced by the modifying relative clause that give milk:

(114) MILK:

O. . . . and is likely to continue to do so as long as there are milkable mammals.

A. It will probably keep on being one as long as there are animals that give milk.

In LIGHT, there is a similar example of this:

(115) LIGHT

O. The only backboned animals capable of luminescence are certain kinds that live in the deep sea.

A. Only a few animals with backbones are able to produce light, and these live in the deep sea.

In example (115), an adjective is changed to a prepositional phrase, while retaining the function of modification.

Syntactic function may also be altered. For instance, in (116), some fifty references is restructed as often mentioned:

(116) MILK

O. . . . and there are some fifty references to milk or milk products in the Bible . . .

A. Milk is often mentioned in the Bible.

In this case, a nominal which functions as the subject of a sentence is changed to a verb functioning as a predicate. We assume that the lexical item references was the motivation for restructuring, since the original structure per se presents no problems of interpretation.

Restructuring caused by change in lexical items. The adaptor may have to restructure the sentence in which a difficult lexical item occurs if there is no replacement lexical item which has the same co-occurrence restrictions or case-relations as the original. In example (117), recommended is changed to told. Notice the restructuring that takes place as a result.

(117) MILK

O. Hippocrates recommended milk as a curative beverage.

A. One of the most famous Greek doctors told his patients to drink milk to cure illness.

Milk is not suitable as the direct object of told, so restructuring takes place. It seems likely that it was the change in the lexical item which caused the restructuring.

In sum, lexical change requires an awareness on the part of the adaptor of what he has already altered in the adaptation, what factors motivate each change, and what is accomplished by the change. It also demands that the adaptor weigh each change to see if it has any unforeseen side-effects on the sentence in particular or on the text in general.

Changes in Rhetorical Devices

There are various changes which occur in the process of adaptation which are closely connected to the syntactic deletion, addition, and restructuring processes discussed above. These changes, however, are not merely changes in the structure of the text, but affect the style of the adaptation. We will refer to these changes as changes in rhetorical devices.

By rhetorical devices, we mean the syntactic devices exploited by the author to influence the way the reader will appreciate the information presented in the text. Examples of rhetorical devices which are changed include the use of rhetorical questions in TREES, which seems to have the effect of involving the reader more directly in the narrative, and the use in DAYTON of emotionally loaded phrases which express the writer's attitudes and feelings directly, such as the description of water as nasty yellow water.

As the texts analyzed were of various types, e.g., expository, narrative, etc., some of the categories in our taxonomy only occur in one text type. We believe, however, that the examples discussed below are not random or idiosyncratic occurrences of some rhetorical device, but can be generalized, if not to all text types, at least to specific genres.

In discussing rhetorical devices, we cannot limit ourselves to a typology of changes alone, because the retention of some rhetorical device in the adapted version may be as significant as the deletion of it. Therefore, we will give a list of the types of rhetorical devices found in the original version, and then comment on whether the same device was used in the adapted version. Note that we cannot simply give a taxonomy of changes as the changes themselves are usually of a very limited type: deletion of specific rhetorical devices used in the original version, or on very rare occasions, addition of rhetorical devices to the adapted version. We will try, however, to discuss general types of stylistic changes which seem to occur in the adaptation process.

Direct Reference to Reader

Use of imperatives. One way for the writer to refer directly to the reader is to use a verb in the imperative, as in both the original and adapted versions of example (118):

(118) TREES

O, A Imagine trees 30 feet thick at the bottom and 300 feet high! And 3,000 years old, and maybe more!

By using an imperative with an implicit "you" subject, the writer seems to "talk" directly to the reader, which is supposed to increase the reader's interest in the narrative (Flesch, 1949). We found that typically this device was retained in the adapted version. Moreover, there seem to be cases where the adaptor added such a device:

(119) MILK

A. Some people believe that milk drinking will become less popular in America than it has been. But remember how long milk has been a basic food and think of the ways in which it is useful.

The second sentence is a summary of facts mentioned earlier. There is no sentence exactly corresponding to it in the original version. Note however, that when the adaptor writes this summary sentence, the imperative is used to enhance reader involvement.

Use of "you." The use of you in the cases below is intended to have the effect of letting the reader be part of the narrative, in his imagination:

(120) LIGHT

O. If you dip a bucket of water and bring it aboard the launch, you can see the light roll away from your hand when you put it in the water.

A. If you dip a bucket of water and dip your hand in it, you can see the light roll away from your hand. (retention of you)

(121) TREES

O. Sometimes a tree is hollowed out all the way to the top. By standing at the bottom and looking up at it, it is possible to see a patch of blue sky much as if one were looking through a telescope.

A. Sometimes a burned tree is hollowed out all the way to the top. By standing at the bottom and looking up it is possible to see a patch of blue sky, as if you were looking through a telescope. (impersonal one changed to personal you)

We found no switch from personal _you_ to impersonal _one_ or _somebody_. On the contrary, we found a tendency to switch from an impersonal sentence to a personal one, by adding a direct reference to the reader.[1]

Use of rhetorical questions and direct quotes. In the original version of example (122), the writer uses a direct quote to express a question presumably asked by the prototypical visitor to the park. In the adapted version, instead of using a direct-quote question, a rhetorical question is used:

(122) TREES

O. "How long can a Big Tree live?" is a question often asked by visitors.

A. How long can a big tree live? The age limit is unknown . . . .

In both cases, the questions have the same function: They enable the writer to ask a question the reader would ask, and to give detailed answers to the question. Again, this enables the reader to identify more with what is happening in the narrative, and breaks the impersonal uniform quality of expository prose.

Unlike the other changes described thus far, _all_ direct quotes are deleted in TREES. The original version contained 18 direct quotes, whereas in the adapted version, we find no direct quotes and only one rhetorical question. The use of direct quotes in the original enabled the writer to quote statements made by the various personalities connected to the history of the park, and to give the comments and questions of the typical park visitor. This allowed the writer to express various points of view as being authoritative (i.e., the views of experts, which lend support to the writer's statements about a series of events). The quotes of the visitors' remarks and the answers are a narrative technique for conveying factual information in an interesting way, and involve the reader more directly. The reader in this case presumably identifies with the typical visitor in the park, and thus takes an imaginary tour of the park--instead of simply being bombarded with factual information. In the adaptation, direct quotes are either deleted entirely or rephrased. In addition, the adaptor systematically deletes all references to the personalities mentioned in the original (except for Colonel G. Steward, originator of the park system) or to visitors in the park. Because of the shift of topic in TREES from the history of the park to the properties of sequoia trees, the quotes attributed to the people connected to the history of the park become irrelevant and are deleted from the A version.

We hypothesize that, all other things being equal, reader involvement devices will be retained. Actually, there is even one example from MILK where a rhetorical question is added to the A version:

(123) MILK

A. Just what do all these milk products give to the people who use them?

The rhetorical question functions as a topic sentence and the writer takes the opportunity to answer the question in the next paragraph.

Devices Expressing Point of View

Often the writer puts some distance between himself/herself and the narrative and gives a detached, unbiased account of the facts. This is typically the case in expository prose of the type found in TREES, MILK, and LIGHT. Occasionally, however, the writer does express his/her own point of view or the view of some other persons. Typically, this is not achieved by saying "I believe X" or "Y believes X," but is done in a much subtler manner (cf. Butler, Note 4). For example, the writer can "sneak in" a sentential adverb (which will express his/her own point of view) in the midst of a seemingly neutral statement:

(124) LIGHT

0. This production of light by living organisms is correctly referred to as bioluminescence.

The writer, however, does not merely give a definition of bioluminescence, but also stipulates that it is correct. By point of view, then, we mean the writer's own judgments, assertions, evaluations, and emotions as expressed in the text.

In addition to expressing his/her own point of view, the writer may choose to cite somebody else's point of view by using direct or indirect quotes.[2] We consider all of these cases to be under the general heading of "point of view." Our main interest here is to note changes in point of view. Although we found in the previous section that there was no significant change in the use of rhetorical devices, apart from a tendency to increase direct reference to the reader in the adaptation, we find that the situation is much more complicated as far as point of view devices are concerned. Below, we will list the various devices which express point of view in the original versions of the texts and we will try to account in a principled fashion for the retention or deletion of these devices in the adaptation.

Higher predicates expressing source of information. When citing any piece of information, the writer may choose to give the source of the information. This is typically achieved by embedding the fact or the information in a frame like: X said, believed, claimed, or exclaimed that Y. Thus, in the original of example (125), the writer has written the following sentence, to emphasize the fact that the sequoias are huge trees:

(125) TREES

O. A railroad freight agent has figured that it would require at least 40 modern flat cars to haul just the trunk alone.

A. And at least forty freight cars would be needed to haul away just its trunk.

While the original text cites the source of the information (i.e., a railroad freight agent), the adapted text does not. The result is that the information gets attributed to the author of the statement rather than to the actual source.

A sentence citing the source of information can be used by the writer in (at least) two major ways: (a) to support the facts by attributing them to some authority; (b) to indicate that the writer avoids taking responsibility for the truth of the complement.

In the first instance, if a speaker says that X claims or believes Y, this is equivalent to simply stating the fact Y. This seems to be how the higher predicate functions in example (125) above. The writer says that a railroad freight agent has figured that . . ., but what the writer actually wants to communicate is not that a railroad clerk figured something out, but rather that it takes 40 cars to haul a tree. In other words, the main assertion of the sentence, as used above, is not the main clause, but the complement clause. Another example of this use can be seen in the original of example (126):

(126) MILK

O. Romans were said by Pliny to rub bread soaked in asses' milk on their faces to make them fairer and prevent the growth of beards.

A. The Romans rubbed bread soaked in asses' milk on their faces. They thought that this would make their skin paler. They also thought it would keep their beards from growing!

Again, the original author cites a source to support this claim. What is communicated is that the Romans used milk for certain special purposes, not that Pliny said something.

Adaptors seem to have a general principal of deleting information they consider unimportant or unessential to the development of the narrative in order to achieve the desired length. As we have already seen, this is the motivation for a number of deletions. We hypothesize that the "source" (i.e., main clause) is deleted when the author just cites it as supportive evidence, but when the main emphasis is on the facts presented in the complement clause. Thus, in examples (125) and (126) above, the "sources" are deleted in the adaptation.

Notice that this parenthetical use of main clauses also occurs in first-person narrative such as DAYTON:

(127) DAYTON

O. I noticed the water kept rising.

A. The water kept rising.

Here the original writer wanted to communicate that something happened, not that she noticed something, and the adaptor chose to delete the source (i.e., main clause).

In other cases, however, the author could attribute information to some source in order to disclaim responsibility and therefore to disagree with the assertion. For example, in TREES, the author has attributed the following to the park visitors:

(128) TREES

O. "What deep roots these trees must have!" exclaim many visitors.

In this case, is is clear from the passage that what is quoted is incorrect; in fact, the next line reads: But the roots seldom go down more than 100 to 150 feet. The author would not want the reader in this case to believe that what the visitors said is true, but rather to assert the true proposition after contradicting a "naive" view.

Similarly, in example (126), it is doubtful that the original author wished to convey that the purpose clause is true (. . . to make them fairer and to prevent the growth of beards). One has to infer, from one's knowledge of the world, that this is a ridiculous suggestion, and therefore we assume that the writer does not believe in it. The adaptor may doubt however, whether a young reader has the necessary world-knowledge to infer that this is not true. Therefore the adaptor adds the source (They thought . . .) in order to emphasize that the author avoids taking responsibility for the truth of the complement. The tone is in fact one of slight irony, reinforced by the use of the exclamation mark after the last sentence in (126)A. In other words, we would expect the source sentence to be retained--or even added, as in example (126)--when it serves the function of attributing a false statement to someone else, a function which is often not immediately apparent but makes a difference in interpretation.

It seems, then, that the retention of the part of the sentence expressing the source (i.e., that X is somebody else's point of view) depends on the adaptor's use of this device. If the source is cited to support the facts, the source is deleted; if the adaptor wishes to emphasize that he/she does not believe in the information cited, the source is retained.

Hedged expressions. Another device expressing point of view is the use of hedged expressions of various sorts. Such hedges may either weaken or strengthen the assertions of the author. Generally, they are deleted in the adaptation, such as correctly in (124) and supposedly in (46). These changes are treated under "modality" in the Content section above.

Emotionally loaded words. Another way in which the writer's point of view is expressed is in the choice of emotionally loaded words. This is especially relevant in DAYTON, which is a first-person narrative and thus allows the author to express her own point of view throughout the story. It seems that the general tendency is to delete emotionally loaded descriptions and retain the "facts" alone. Thus, compare the following:

(129) DAYTON

O. The whole street was full of water--nasty yellow water.

A. The whole street was full of water.

(130) DAYTON

O. . . . a young fellow with his face perfectly white and his eyes bulging out from his cheeks.

A. He was a young fellow and his face was perfectly white.

It is possible that these descriptions, which deal with the original author's emotions and reflections, are deleted because they do not seem appropriate for the intended audience, as noted in the discussion of thematic information deletion above. The net effect is to make the text more uniform in tone, without extremes of emotion.

Indications of extremes of emotion, if not completely deleted, may be transferred to other lexical items, as in the following example from DAYTON, in which the adaptation deletes the colloquial emotional expression "My God." In order to preserve a minimal amount of the emotional impact, the adaptation changes the neutral say to a mere emotive scream:

(131) DAYTON

O. "My God" said Jack. "It's a man. I'm going after him."

A. "It's a man," Jack screamed. "I'm going after him."

This then, is another example of the "domino effect," where one change (deletion of material) leads to another change, in this case, of a lexical item.

Additional Stylistic Changes: Shift from Colloquial to Formal Language

As mentioned above, DAYTON is a first-person narrative. The original McClure's article is written as a personal eyewitness story. The style is informal, closer to oral than to written style. In the adapted version, we observed a systematic deletion of elements which are not considered proper written English. Examples are given below:

(132) DAYTON

O. And finally Mrs. Rawlins, the woman next door . . .

A. Finally Mrs. Rawlins, the woman next door . . .

(133) DAYTON

O. At half past eight there was a big yelling up the street. and--crack!

A. Then up the street we heard a big yelling and a crack.

(134) DAYTON

O. "Cheer up, Kid!" he called . . .

A. "Cheer up!" he called . . .

(135) DAYTON

O. But I was thinking of Jack.

A. I was thinking of Jack.

Examples (132) and (135) contain sentence-initial conjunctions, which occur freely in colloquial language but are proscribed in formal written language. (133) has an onomatopoetic word which would not be out of place in an oral narrative. In (134) kid is used in a slangy way.

Concluding Remarks

The instances of success or failure in adaptation which we have commented on are local rather than pervasive; the changes of each type generally occur in small numbers in a text, and they are subtle rather than blatant in their effect on the adapted text. That is, the presence or absence of a piece of detail, a conjunction or relative clause, the choice of one lexical item over another--none of these individually is going to change materially the reader's processing of the text. Further, the effects of all the changes in a text are cumulative, and it is therefore hard to isolate specific factors to test their effects independently; and since the changes made in a text are often interdependent, a given kind of change may have different effects in different texts, depending on features of the text and what other changes might be made in that text.

In this study, we have extended some very general methods of linguistic analysis into a somewhat novel area of research. These are: (a) organizing the data into equivalence classes of similar items--typology of changes from the different texts; (b) defining the relationship between the classes, which we have touched on in discussing the "domino effect" and describing changes as belonging to complementary types; (c) forming contrasting pairs of items which are similar but differ by one or more definable factors--for example, the original and adapted versions of sentences, or successful and unsuccessful applications of the same type of change.

Of particular interest to us are the cases where a change fails to reproduce the original text accurately or where it brings in other problems that require further change in related areas of the text. Very often the nature of some phenomenon can be better understood by looking at cases where a generalization about it could hold but fails to do so, i.e., where an expected result is not obtained. Discussion of cases of failure is not to be taken as criticism which we are leveling against adaptations, except where explicitly noted. In general, the adaptations used in this study were done with care and common sense, sometimes exceptionally so, in spite of the requirements imposed on the materials and the limits of exact knowledge about what constitutes complexity in language.

In this study we have been concerned with the difference between readability, as measured by averages calculated by formulas, and specific features of the language in a text. Any changes made in the adapted version of the texts we have studied is assumed to have been made in order to increase readability. Of course not all were successful, in our judgment, but in the cases where the changes had the intended effect, we were interested in whether there were general principles that could be made explicit. The obvious ones are derivable from readability formulas. Clearly some of the changes in individual sentences are changes in features, like length of sentences of words, whose averages over the text are measured by readability formulas. If these were the only relevant factors in adaptation, it would be possible, one imagines, to create adaptations by blindly and mechanically changing features of the text to which readability formulas are sensitive, and nothing more.

Of course, a simplistic strategy of this nature is not possible, because not all sources of difficulty can be measured by readability formulas, in the first place, and in the second, there are usually several complementary methods by which vocabulary difficulty and sentence length can be reduced. Of course, this presupposes that sentence length always contributes to complexity, which is not the case. Sentence length may be reduced by splitting up complex sentences into components, but the relationships between them may then have to be spelled out, requiring the addition of more words. Material may be condensed by coalescing several simple sentences into one--creating a relatively long and complex sentence. A difficult vocabulary item may not be able to be reproduced in simpler terms except by paraphrase, adding a clause or phrase to the sentence. Which strategy is most appropriate and effective is obviously a matter more of the writer's judgment than of something measurable by formula. Deletion of content is obviously constrained by the need to have the text remain coherent.

The measurement of text coherence is not a trivial task. Readability formulas do not measure aspects of what we have called organizational information. Deletion of topic sentences, summaries, and transitions clearly places a premium on the reader's inferencing ability to determine what is being talked about and how it relates to previous material. The amount of inferencing a reader might have to do may depend as much on his/her knowledge of the topic under discussion as on the "structure" of the incoming text. It is likely that no formula can be devised to determine how much organizational information is needed to facilitate maximal comprehension by a reader at a certain level for a particular genre. Thus, the adaptor must be aware of this type of information and must gauge the intended audience's need for overt structuring information.

Just as reading formulas cannot measure the amount of organizational information needed to present topics clearly to the intended reader, neither can they measure the amount of elaboration needed to make the point salient or noteworthy. It would be hard to generalize about how much and what kind of elaboration is needed to maximize comprehension, as this could vary greatly from topic to topic. It seems that while, on the one hand, too much elaboration can have a deleterious effect on comprehension by obscuring the point, on the other hand, too little can make the point seem unimportant and not worth remembering. The amount and type of elaborational information affects interest level, and it is well known that interest level and comprehension are closely related.

Other changes, as we have noted, involve constructions whose contribution to reading level cannot be measured by formulas. For example, the negative construction in example (43), do not wither for years, is difficult to process because the negation affects the phrase for years rather than the verb, as one would have normally expected. The adaptor, alert to a possibly confusing ambiguity, changed the construction to an unambiguous positive expression.

It is only the adaptor's sensitivity to language which would detect ambiguities in the scope of negation and in other contexts. Ambiguities of this sort require the adaptor to exercise judgment as to whether the ambiguities would pose serious difficulties to the reader in the context in which these constructions are used. Sometimes one possible reading is excluded by contextual information, but sometimes not.

Another source of difficulty which is not measurable by readability formulas has to do with pronouns and other anaphoric devices which link clauses and sentences. One early version of the Flesch readability formula (Klare, 1963, p. 57) did in fact count pronouns as a measure of redundancy and shared content, though demonstratives and zero anaphora were not measured. These other syntactic devices nevertheless perform the same grammatical function of indicating identity with what has gone before. We noted that indefinite subjects (example (32)) and repeated or redundant elements (85) are often not overtly expressed. The absence of the elements which are not expressed allows the sentence to be compressed--or deliberately inexplicit, without confusion. But if one assumes that the reader has less than an adult's store of background knowledge, the unexpressed anaphoric elements may create unforeseen pitfalls. The only way to make certain that such pitfalls are avoided is for the adaptor to fill in all referential or repeated information, with demonstratives added to provide explicit indications of what is linked by identity of reference across sentence boundaries. This strategy would, however, considerably lengthen the individual sentence, and, in addition, a strange stylistic effect is created by sequences of simple sentences with fully specified noun phrases and adverbs (e.g., After that).

Information which is not explicitly expressed is a source of serious potential difficulty in other ways as well. These are the very unpredictable and subtle ways in which information is conveyed without actually being said. Sometimes the reader must make inferences from what is said in order to get at what the writer is really trying to convey. Unlike the anaphoric devices mentioned above, whose function is fairly clearly defined, expressions which may implicate extra meaning are of every category and description. Clearly the writer's intention to convey meaning by implication is not something which can easily be measured by a formula. But one can easily imagine a text being incomprehensible or given an entirely different interpretation from the intended one, if the crucial inferences are not correctly made. (See example (53) and others discussed under Basis Information.) Whether or not crucial inferences are correctly made will depend largely on surface information available, such as sentence connectives.

In the case of very important inferences, one would expect an adaptor to see the possible difficulty and to spell out the intended meaning more clearly; there are cases of this discussed in connection with examples (54) and (55). We are also concerned about more subtle cases, where the loss of information is very small in each individual case; for example, the deletion of conjunctions at the beginnings of sentences, as in example (80), and the splitting of sentences into component independent clauses with deletion of the conjunction, as in example (3). To describe the semantic contribution of conjunctions is somewhat difficult. Strictly speaking, the reader may infer something from the presence of the conjunction, which indicates relatedness of subject matter between clauses, and from the order in which related clauses are said. But in effect, information of this kind about relatedness, and causal or temporal relations, is so regularly conveyed by conjunctions that an inference is required unless specifically denied by the context. While the content of the original sentence may not be destroyed by the changes made in adaptation, the whole text may be subtly distorted by the absence of these small indications of relatedness of topic, time, and causality. Leaving the conjunctions in, however, creates long and complex sentences, which have a reputation for being "difficult" constructions, especially if they contain subordinate clauses (see Dawkins, 1975). The adaptor obviously has to balance the risk of disconnectedness against the alleged liability of long sentences. But a text may be rendered unforeseeably more difficult to read if it consists of a string of unconnected sentences. The adapted version may therefore have fewer cues than the original for relating sentences. The loss of information may have greater effect than an adult might realize because younger readers have less background information and less experience in making correct inferences. This is a hypothesis which is obviously hard to test but needs careful investigation.

The constructions whose features are summarized above are all ones whose difficulty cannot be measured by the averages computed by readability formulas over a whole text, since their difficulty may vary relative to the immediate context. The communicative functions which various constructions may have are beginning to be understood better by linguists, and we have offered some observations from the texts we studied in support of generally held hypotheses about them. While much has been written about the structure of an overall text, there is no theory of text structure which is well enough supported and developed to be combined with formulas for calculating readability. Ideally, a measurement of readability should include not only *average* figures based on a few parameters, but also means of identifying redundancy of content or the lack of it, and of calculating how consistently topics are identified and maintained, to give the text coherence and logical progression of ideas. It would be hard indeed to devise experimental means of measuring the contribution of a given construction to readability of a text, or of measuring the effect of text structures on comprehension. Yet is seems to us that an understanding of the notion of readability is seriously inadequate without such measurements.

Another category of construction which is usually changed in adaptation is what we have been calling *modality*, and it is another example of what appears to be intrinsically complex while having a specific discourse function. The effect of changes in modality on the entire text is to obscure the differences between the straight fact and supposition, between the points of view of one individual and another. The ideas in the adapted text are typically presented as bald facts, without qualification or attribution, and without offering the reader a chance to see what basis an assertion might have. Someone reading prose intended for adults must be able to make judgments routinely on the basis of the source of a proposition, and while younger readers are indeed given some practice in basal readers and other material in distinguishing fact from opinion, it surprises us that fairly mature readers for whom the four adaptations were intended are not given more practice in dealing with such information. It seems to us counterproductive to adhere rigidly to norms of sentence length and complexity where such issues are concerned.

Likewise, we noted thoughout this paper that language expressing emotion was systematically toned down or deleted. Some of these changes may have been to shorten the length of a sentence or to guarantee that the words will all be familiar--archaic or slangy expressions are often changed. But even though we had no preconceived notions about the sacredness of the features of the original text, we all came to feel that the adapted texts were dull and lacking in variety compared to the original texts. A colleague has noted that the changes in the adaptation of DAYTON removed a whole sense of character and time which had been present in the original. We speak of course from the perspective of adult readers; we simply do not know how great a barrier to readability is constituted by the emotive and colloquial language of the original text, or how great a difference would be perceived by younger readers between the original content and the adapted paraphrase. But we wonder if the archaic and colloquial features of DAYTON did not in themselves communicate some very subtle information which is part of the story and part of the reasons to read about a flood of 65 years ago. This point of view is a familiar one in the context of literary study, and we would not want to go to the extreme of Bishop (1935), who claims that any change made in adaptation is a betrayal of the author's intention. Clearly children do not learn to read by being given great works in the original which they cannot interpret. But it seems unproductive to give practice in reading which avoids dealing with features of language which are in some large sense the substance of reading, i.e., literary language and other kinds as well.

We want to argue that there are features of texts which contribute to readability, if properly used, and that these have not been given their due as contributing to readability because they are difficult to quantify. Yet they play important roles in comprehension, all the more crucial to identify because their effects are subtle and therefore not always likely to be noticed where changes are made in adaptation which could create unforeseen difficulties. Their effects are also tied to larger issues which must be confronted in learning to deal successfully with "adult" language, such as point of view, style, epistemological status, etc. If we can reach a better understanding of what constitutes readability, it will be possible to break with the conventional wisdom reinforced by readability formulas, and thus to use a greater variety of language and structure than is now used, without contributing to difficulty. The adaptation of MILK is in many ways a good example of what is achieved when the adaptor is sensitive to the demands of discourse structure as well as readability formulas; we think that adaptations can be taken still further away from formulas without loss of readability. That is, it would not be necessary to make arbitrary changes in order that texts be "homogenized" throughout to some level of readability, if "difficult" language and content are used in a controlled way. But such adaptations obviously require a great deal of care and thought, and cannot be done mechanically.

There are some implications of this study for other kinds of adaptations, for instance, those which present the contents of regulations or legal documents in "plain language." If the content is to be preserved, then redundancies must be very carefully identified and only excised when truly redundant, while lexical substitutions and sentence shortening must be done with care so as not to distort the content. Some content may have to be sacrificed if length of the text is a primary consideration as when captions are superimposed on episodes in televised or filmed presentations.

Readability formulas fail to give any adequate characterization of readability, except in the purely statistical sense. They offer no helpul guides to the writer. We think that the specific examples we discuss here make a strong case against using readability formulas as guides to writing. We urge writers to rely on their own judgments about language which is appropriate for the intended reader and not on stereotyped notions or readability formulas.

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Footnotes

[1] These are the devices similar to those which Flesch (1949) and Gunning (1952) claim lead to greater "human interest." Flesch defines personal sentences (which in his view increase reader involvement) as direct and indirect quotes, questions, requests, and exhortations addressed directly to the reader.

[2] The distinction between the two uses of source sentences is similar to the distinction observed by Reinhart (1975) between various sentences containing parentheticals. Reinhart convincingly argues that parentheticals can be used to present the main clause (which corresponds to the clause embedded under the verb of saying or believing in our case) from two different points of view:

(a) He$_i$ would be late, John$_i$ said.

(b) John$_i$ would be late, he$_i$ said.

(a) is a report of what John actually had said and the main clause represents John's (and not the speaker's) point of view. (b) on the other hand is used to represent the speaker's (or writer's) point of view, and the *he said* is just added to further support the speaker's assertion. The latter use of parentheticals corresponds to what we call the parenthetical or reduced use of *X believes* or *X says* in the texts we examined.

Table 1

Comparisons of Original and Adapted Texts

	TREES		DAYTON		MILK		LIVING LIGHT	
Number of Words:								
Original	3,000*		4725		1256		1450	
Adaptation	775		827		861		900	
% of Original Length	25%		17%		68%		62%	
Number of Sentences:								
Original	250*		375*		58		75	
Adaptation	62		90		63		61	
	Fry	Dale-Chall	Fry	Dale-Chall	Fry	Dale-Chall	Fry	Dale-Chall
Reading Level:								
Original	5	5-6	4+	4.9	10	11-12	11	11-12
Adaptation	6	5-6	2	4-	5	7-8	8	7-8

Note. See page 8 for sources of these texts.

* estimate

Table 2

Average Number of Words Per Sentence

	MILK	LIGHT	DAYTON	TREES
Original	24	19	12.5	12.5
Adapted	13	14	9	12

Table 3

Clause Complexity in LIGHT and MILK

Number of Sentences in:	Number of Clauses Per Sentence					
	1	2	3	4	5	6+
Light						
Original	21	22	23	7	3	-
Adapted	22	20	12	-	-	-
MILK						
Original	20	16	12	2	3	6
Adapted	29	21	15	6	-	-

Note. In counting number of *clauses*, we have included subject, object and adverbial complement clauses, and relative clauses, including reduced post-nominal modifiers, and parentheticals. We have excluded prenominal modifiers, nominalizations, and conjoined noun phrases, even though these might have been derived from some more complex source which involved clauses. Our criterion was essentially whether there is a major constituent break in surface structure. Though we have been arbitrary in a few cases, the measure we give is, in general, consistent.

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